kwiet POWER

Shindaiwa Generators

Owners Manual

Model DGK25C

Sound Attenuated Diesel Generator Set With SimulPhase Technology®

WARNING!
CALIFORNIA – Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

shindaiwa
Construction Products

3/9/09

Table of Contents

1. INTRODUCTION 4

2. SAFETY INSTRUCTIONS 5

3. LABELS 11

3.1 Locations 11

3.2 Label Part Numbers 15

4. SPECIFICATIONS 16

5. DESCRIPTION 17

5.1 Layout 17

5.2 Outside View 18

5.3 Control Panel 20

5.4 Generator 22
5.4.1 Stator 23
5.4.2 Rotor 24

5.5 Receptacles and Main Terminals 25

5.6 Drain Plugs and External Fuel Connections 26

6. EQUIPMENT 27

6.1 Engine Control Circuit 27

6.2 Monitors and Displays 28

6.3 Meters and Gauges 30

6.4 Lamps and Lights 31

6.5 Switches 31

6.6 Output Circuit Breakers 33

6.7 Voltage Adjust Rheostat 33

6.8 Voltage Selector Switch 34

6.9 3 Way Fuel Valve 35

7 LIFTING, TRANSPORTING, AND INSTALLING..... 36

7.1 Lifting 36

7.2 Transporting 37

7.3 Installing 37

8. SIMULTANEOUS THREE PHASE AND DUAL VOLTAGE SINGLE PHASE OUTPUT 38

9. CONNECTING CABLES 39

9.1 Main Terminal Connections 480/277V Position 39

9.2 Main Terminal Connections 240/139V Position 40

10. GENERATOR TECHNICAL SPECIFICATIONS..... 41

11. INITIAL STARTUP AND PRE-CHECKS 42

11.1 Checking Engine Oil 43

11.2 Selecting the Proper Engine Oil 44

11.3 Checking for Leaks..... 44

11.4 Checking Engine Coolant 45

11.5 Checking the Fan Belt 46

11.6 Checking the Fuel Level..... 47

11.7 Checking the Battery..... 47

12. OPERATION..... 48

12.1 Starting the Generator..... 48

12.2 Loading the Generator..... 49

12.3 Operating the Generator 49

12.4 Stopping the Generator..... 49

13 GENERAL MAINTENANCE 50

13.1 Engine Maintenance 50

13.2 Periodic Maintenance Table..... 51

13.3 Changing Oil **52**

13.4 Replacing the Oil Filter **53**

13.5 Cleaning/Replacing the Air Filter Element **55**

13.6 Cleaning/Replacing the Fuel Filters **56**

13.7 Replacing the Electric Fuel Pump Filter **57**

13.8 Draining Water from the Internal Fuel Tank **57**

13.9 Replacing LLC (Long Life Coolant) **58**

14. TROUBLESHOOTING TABLE **59**

15. LONG TERM STORAGE **60**

1. Introduction

Thank you for purchasing a Shindaiwa kWiet Power sound attenuated diesel generator.

This manual contains important information for the maintenance and safe operation of the Shindaiwa diesel generator model DGK25C.

- Read and thoroughly understand this manual before operating the generator.
- This manual should be kept on or near the generator at all times.
- To maximize the useful life of the generator, follow the recommended periodic maintenance schedule and maintenance checks according to the table on Page 51 of this manual.

2. Safety Instructions

In this manual, safety items are classified as WARNING and CAUTION.

WARNING

Indicates a potentially hazardous situation which if not avoided could result in death or serious injury.

CAUTION

This symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.

Note that CAUTION items could also lead to major accidents under some circumstances if not correctly followed.

All items listed in this manual are important for the safe operation of this generator set. Be sure to follow them closely.

Warning

DANGER OF ELECTRIC SHOCK

DO NOT CONTACT THE OUTPUT TERMINALS DURING OPERATION!

Contacting the output terminals while the generator set is operating can cause a fatal electric shock. If it is necessary to contact the output terminals (such as for load connections), ensure that the generator set is not operating.

DANGER OF EXHAUST GAS POISONING

DO NOT OPERATE THIS GENERATOR SET IN AN ENCLOSED AREA!

The engine exhaust gas on this generator set contains substances that have been proven to be harmful to human health.

Operate this generator set in a well ventilated area only. Using the generator set indoors or in other enclosed places can cause exhaust gas poisoning.

DANGER OF INJURY CAUSED BY ROTATING PARTS

DO NOT CONTACT ROTATING PARTS DURING EQUIPMENT OPERATION!

Stay clear of rotating parts such as the fan, belts or pulleys when the generator set is running.

Coming in contact with rotating parts could cause severe bodily injury.

Turn off the engine before inspecting or conducting maintenance work on this generator set.

DANGER OF ELECTRIC SHOCK, INJURIES OR BURNS

PRECAUTIONS FOR MAINTENANCE AND INSPECTIONS!

Before conducting inspections or performing maintenance work, remove the key from the ignition switch and place a DO NOT OPERATE sign or similar warning over the ignition switch.

Accidental operation of the engine during inspections or maintenance work can cause serious accidents.

CAUTION

TRANSPORTATION

DANGER OF FALLING EQUIPMENT!

HANDLE SUSPENDED EQUIPMENT WITH CARE!

Do not use twisted or frayed wire cable to lift the generator set.

Do not twist lifting chains. Twisted chains can easily break.

HANDLE THIS EQUIPMENT ONLY AT THE DESIGNATED LOCATION!

The generator unit is designed with a single point lifting hook on the top section.

Do not lift the unit at any other point or it may be unbalanced.

INSTALLATION

DANGER OF INJURIES

⚠ **DO NOT INSTALL THIS EQUIPMENT ON SLOPED OR UNEVEN GROUND!**

Operating on sloped or uneven ground may cause the generator to move resulting in personal injury.

OPERATION

DANGER OF FIRE

⚠ **USE EXTREME CAUTION WHEN ADDING FUEL OR OIL!**

Before adding fuel or oil, stop the engine and make sure there are no open flames in the immediate area.

If fuel is spilled or leaks onto hot parts or electrical components, a fire could occur.

If fuel or oil is spilled, clean up the area immediately.

Close the fuel fill or oil fill cap securely after supplying fuel or oil.

MAINTENANCE AND INSPECTION

DANGER OF BURNS OR FIRE

⚠ **DISCONNECT THE BATTERY BEFORE INSPECTIONS OR MAINTENANCE!**

Before conducting inspections or maintenance, disconnect the negative (-) cable from the battery terminal.

Conducting inspections or maintenance with the battery cables connected may cause a short circuit resulting in burns or fire.

⚠ DO NOT ALLOW WATER TO CONTACT ELECTRICAL PARTS!

Allowing water to come in contact with electrical components could cause a short circuit resulting in a fire.

If water accidentally comes in contact with electrical components immediately de-energize them and use clean dry compressed air to completely dry them out prior to re-energizing.

PRECAUTIONS IN HANDLING THE BATTERY

⚠ HANDLE THE BATTERY CAREFULLY!

Batteries generate hydrogen gas and oxygen gas both of which are extremely flammable.

Flames or spark producing devices can cause an explosion when brought near the battery.

Handle the battery with extreme caution.

(1) Wear protective glasses and rubber gloves when conducting maintenance work or inspecting the battery.
(2) Do not smoke or generate sparks or flames near the battery.
(3) Stop the engine before conducting inspections or maintenance on the battery.
(4) Do not short circuit the terminals of the battery.
(5) When removing battery cables, disconnect the cable at the negative (-) terminal first. When connecting the cables, connect the positive (+) terminal first.
(6) Charge batteries in well ventilated areas only.
(7) Connect cables securely to each terminal post. Loose cables may generate sparks and cause an explosion.
(8) Before conducting maintenance work on the electrical system remove the negative (-) cable from the battery.

⚠ HANDLE ELECTROLYTE WITH CARE!

Electrolyte contains dilute sulfuric acid. Careless handling of the battery can cause the electrolyte to spill which could result in the loss of eye sight or in burns.

Any work that requires the handling of electrolyte must be done under the supervision of someone knowledgeable in safe electrolyte handling procedures.

Maintain the electrolyte level in the battery above the minimum level.

Electrolyte spills should be immediately flushed with large volumes of clean water.

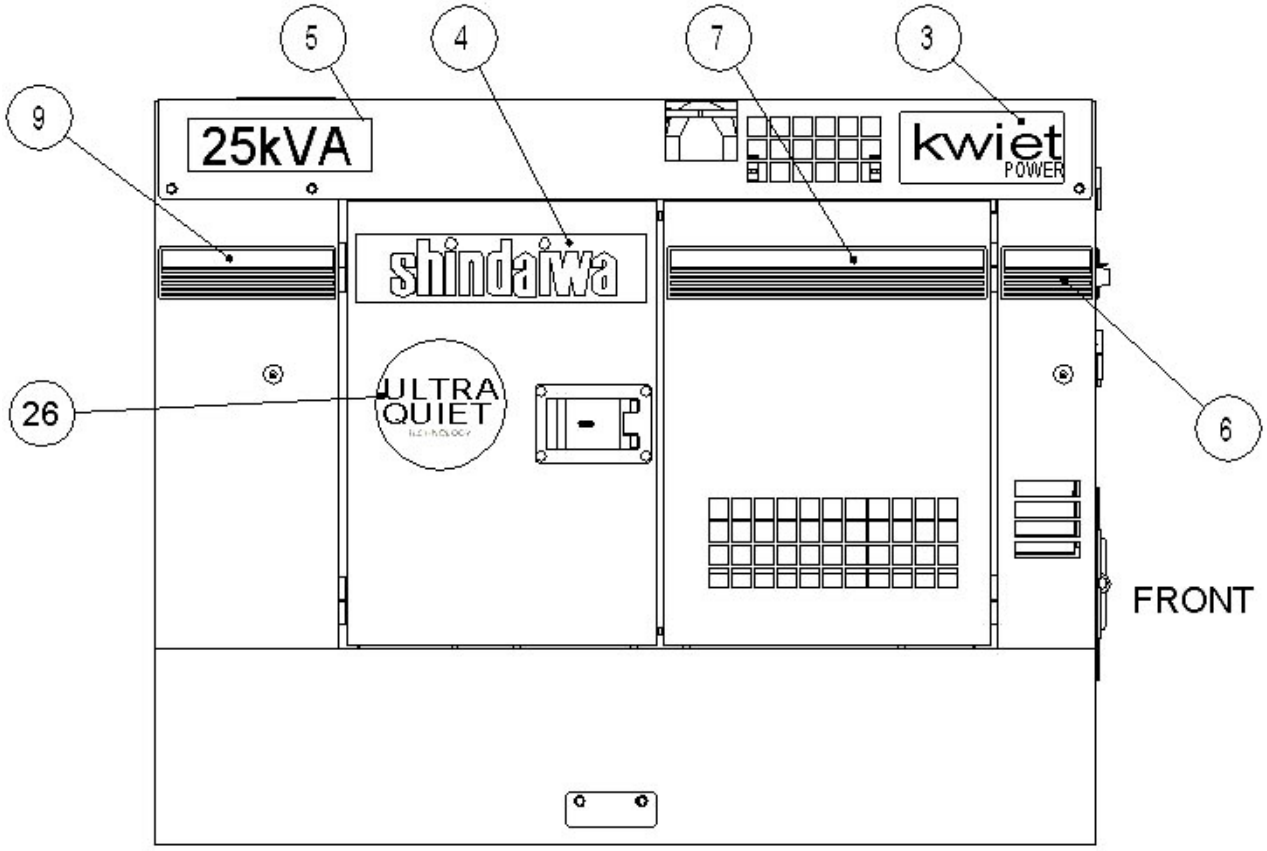
If electrolyte accidentally enters the eye or eyes, immediately wash with large volumes of clean water and consult a physician as soon as possible.

If electrolyte is swallowed, rinse the mouth repeatedly with large volumes of water and consult a physician as soon as possible.

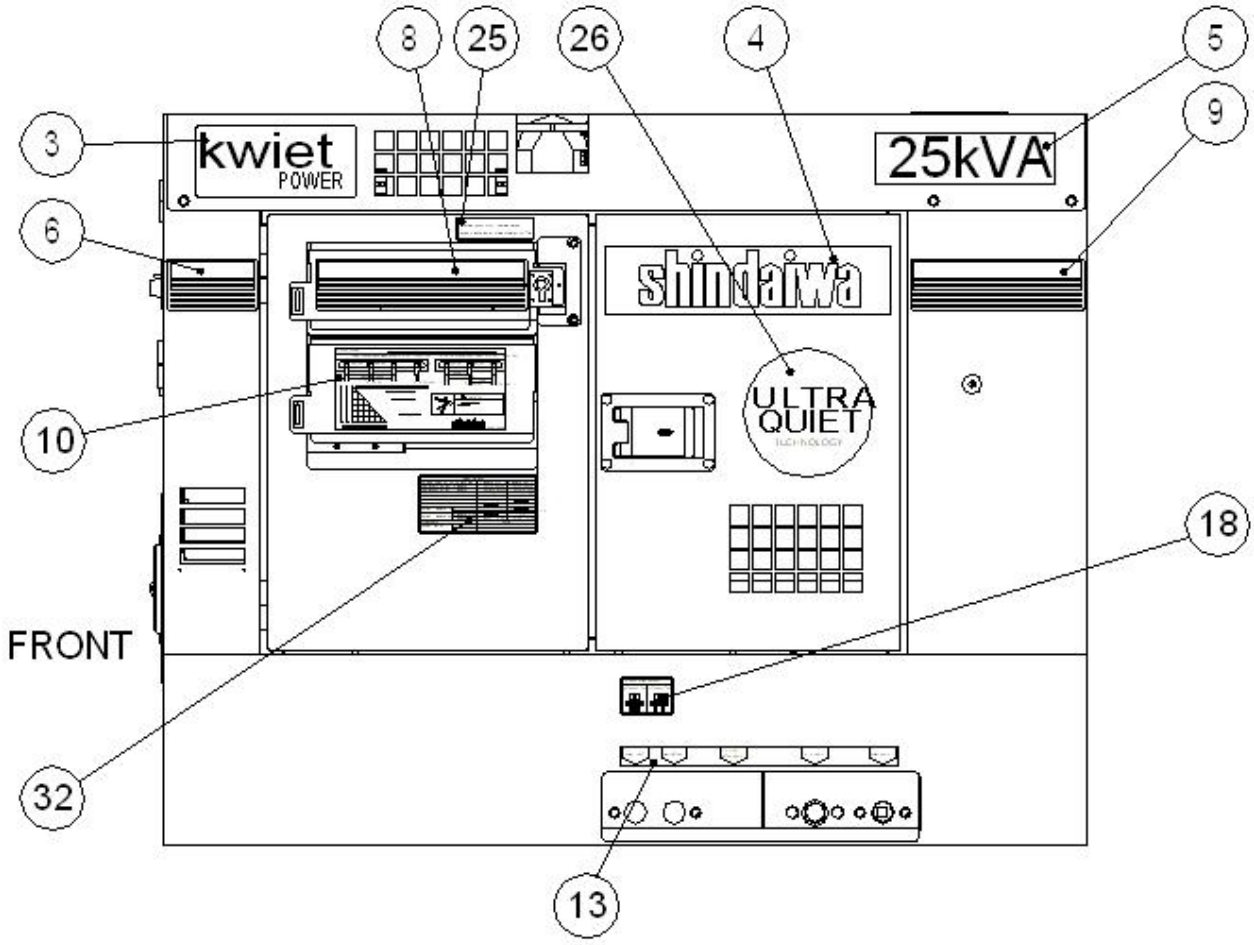
3. Labels

3.1 Locations

- Label part number descriptions are listed on page 15.



Note: Ensure all labels are undamaged and readable. Immediately replace any damaged or missing labels. New labels are available from your local Shindaiwa distributor or dealer.



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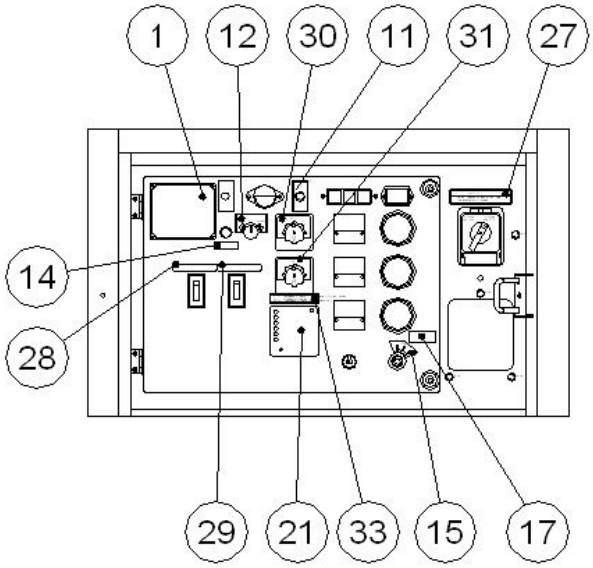

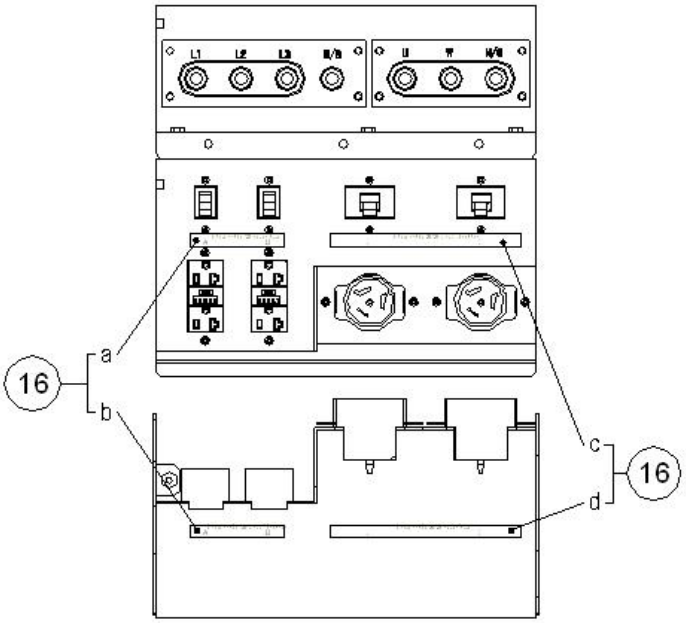

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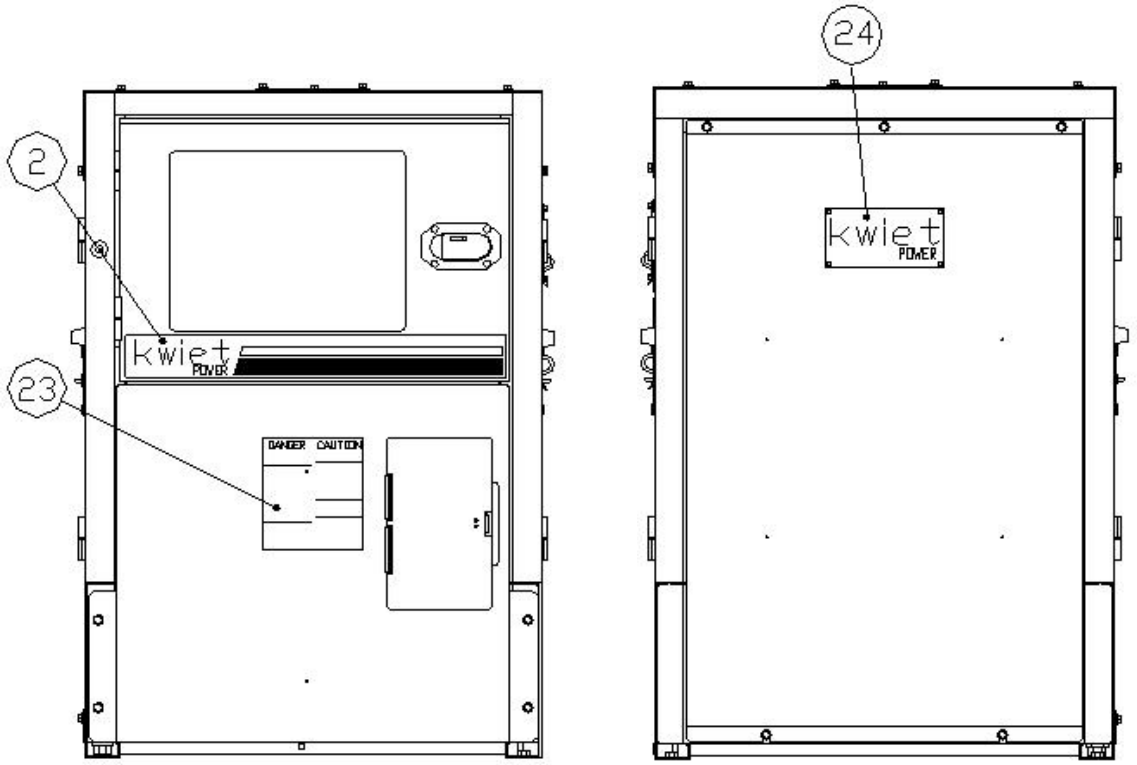
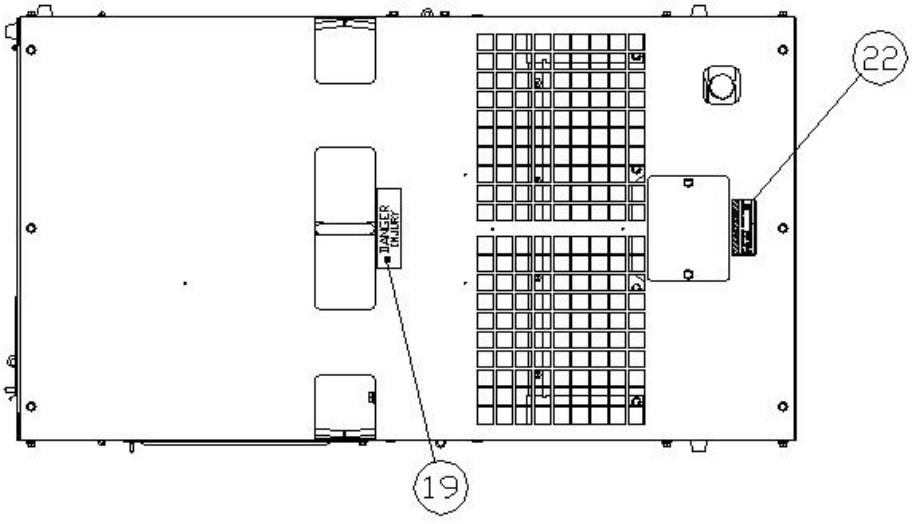


Front **Back**



Top

Note: Ensure all labels are undamaged and readable. Immediately replace any damaged or missing labels. New labels are available from your local Shindaiwa distributor or dealer.

3.2 Label Part Numbers

Reference Number	Part Number	Description	Quantity
1	71260-91310	Name Plate	1
2	19406-00115	kWiet Power Decal	1
3	19406-00089	kWiet Power Decal	2
4	19420-00057	Shindaiwa Decal	2
5	19404-00025	25 kVA Decal	2
6	19407-00078	Decorative Stripe	2
7	19407-00079	Decorative Stripe	1
8	19407-00080	Decorative Stripe	1
9	19407-00081	Decorative Stripe	2
10	71260-91320	EPA Emissions Label	1
11	19401-00212	Panel Light Label	1
12	19401-00214	Voltage Adjust Rheostat Label	1
13	19401-00405	External Connections and Drains Labels	1
14	19401-00211	Pilot Lamp Label	1
15	19401-00216	Ignition Switch Label	1
16	19401-00404	Receptacle Labels	1
17	19401-00401	Internal Fuel Tank Level Label	1
18	19401-00400	Output Connection Diagram Label	1
19	19402-00210	Lifting Hook Label	1
20	71260-91330	Hidden Serial Number Plate	1
21	19407-00055	Auto Start Panel Cover	1
22	19402-00295	Long Life Coolant Specification Label	1
23	19402-00306	Main Warning Label	1
24	19502-26000	kWiet Power Metal Plate	1
25	19401-00390	Emergency Stop Label	1
26	19406-00111	Ultra Quiet Technology Label	2
27	19402-00288	Voltage Selector Switch Caution Label	1
28	19401-00412	Three Phase Breaker Label	1
29	19401-00411	Single Phase Breaker Label	1
30	19401-00409	Voltmeter Selector Switch Label	1
31	19401-00410	Ammeter Selector Switch Label	1
32	19406-00118	Specifications Label	1
33	19402-00215	Ammeter Selector Switch Positions	1
34	19401-00372	Three Way Valve Label	1
35	19401-00431	Terminal Cover Instruction Label	1

4. Specifications

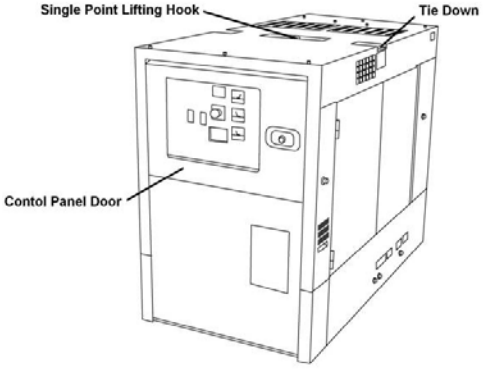
DGK25C Specifications				
Alternator	Generator Type			Revolving Field Brushless Ac
				Simultaneous 3 Phase-120/240V 1 Phase
	Rated Output		kVA	25
			kW	20
	Voltage-Three phase		V	208,240,480
	Voltage-Single phase		V	120,139,240,277
	Amps	Single phase-120V		62.5 x 2
		Single phase-240V		62.5
		Three phase-208V		69
		Three phase-240V		60
		Three phase-480V		30
	Frequency-regulation		Hz	60/50 ± 5%
	Rated Speed		rpm	1800/1500
	Winding			Star with Neutral
	Power Factor			.8
	Insulation class			F
	Excitation			Self excitation (brushless)
	No. of poles			4
Engine	Type			Vertical Water Cooled 4-cycle Diesel
	Model (Manufacturer)			4LE1 (ISUZU)
	No. of Cylinders (bore x stroke)		(**in.**/mm)	4 (**3.35 x 3.78**/85 x 96)
	Continuous Rated Output		hp	31
	Rated Speed,60/50Hz		rpm	1800/1500*
	Displacement		**cu. in.**/liters	**133**/2.179
	Combustion System			Swirl Chambered
	Cooling Method			Radiator
	Lubricating Method			Forced Lubrication
	Starting Method			Electric
	Fuel			ASTEM No. 2 Diesel
	Fuel Consumption		**gal.**/liters	**1.57**/5.94 per hour @ full load
	Lubricating Oil			CD class or higher
	Fuel Tank Capacity		**gal.**/liters	**20.6**/78
	Lubricant Volume		**gal.**/liters	**2.2**/8.5
	Cooling Water Volume		**gal.**/liters	**2.2**/8.2
	Starting Motor Capacity		V-kW	12V-2.0kW
	Charging Alternator Capacity		V-A	12V-20A
	Battery Capacity		V-AH	12V-80AH
Meters	Voltage/Frequency/Amperage/Hour			
Voltage Regulation	Automatic Voltage Regulator			3 Phase ± 1.0%
				1 Phase ± 5.0%
Shutdowns	Oil Pressure, Water Temperature			Lamp indication with shutdown
Warning	Battery Charge			Lamp indication
Unit	Dimensions (L x W x H)		**in.**/mm	**57 x 31 x 45**/1440 x 780 x 1140
	Dry weight		**lbs.**/kg	**1543**/700
Sound Level	No Load		dB(A)	53
	Full Load		dB(A)	56

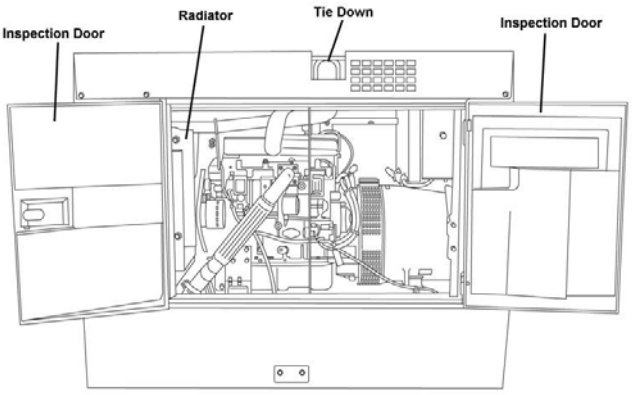
*Emissions certified at 1800 rpm only

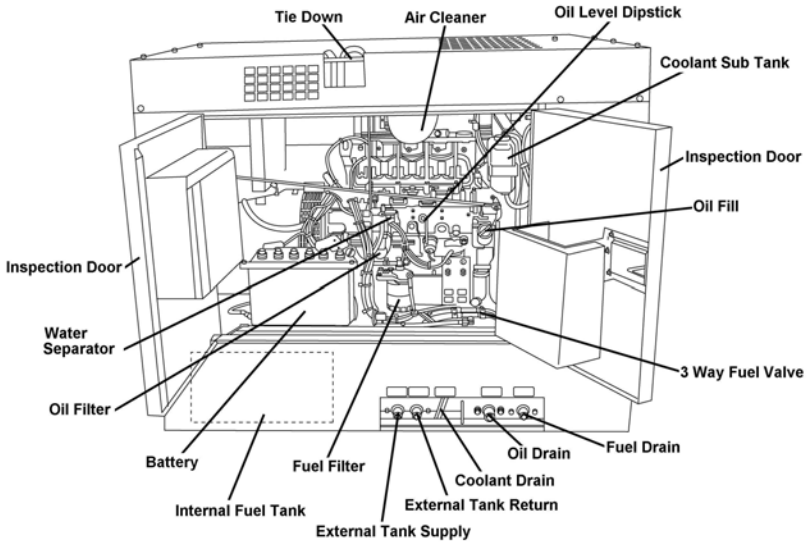
Standard Conditions: Altitude: 3280 ft (1000m) or lower, Temperature: 5-104°F (-15 to +40°C), Humidity: 85% or lower (no condensation)

5. Description

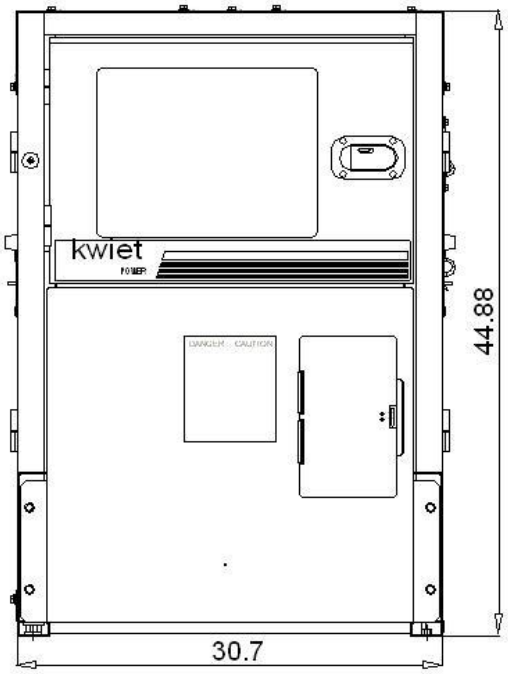
5.1 Layout

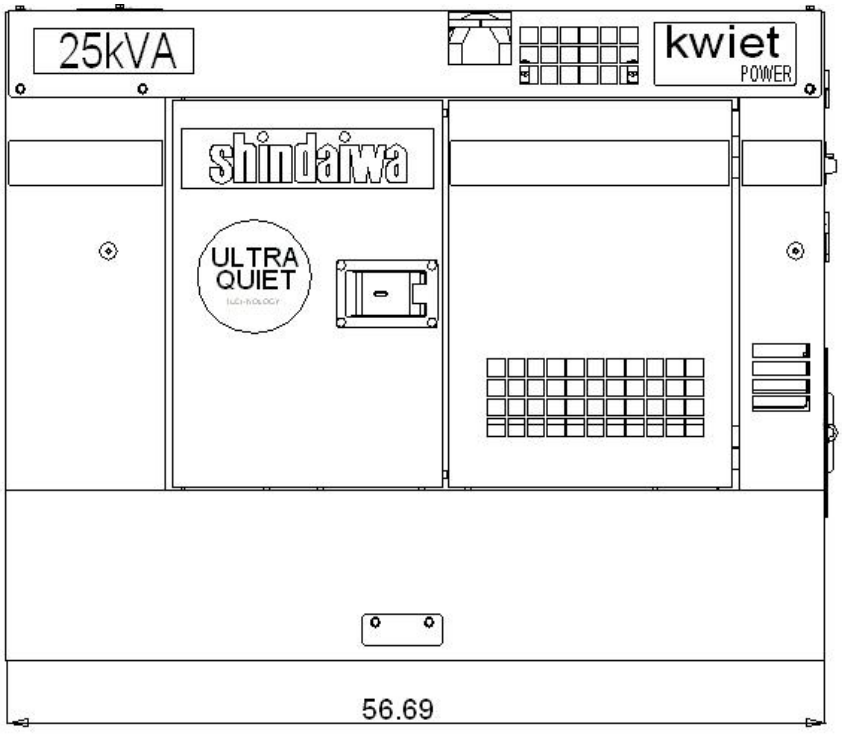




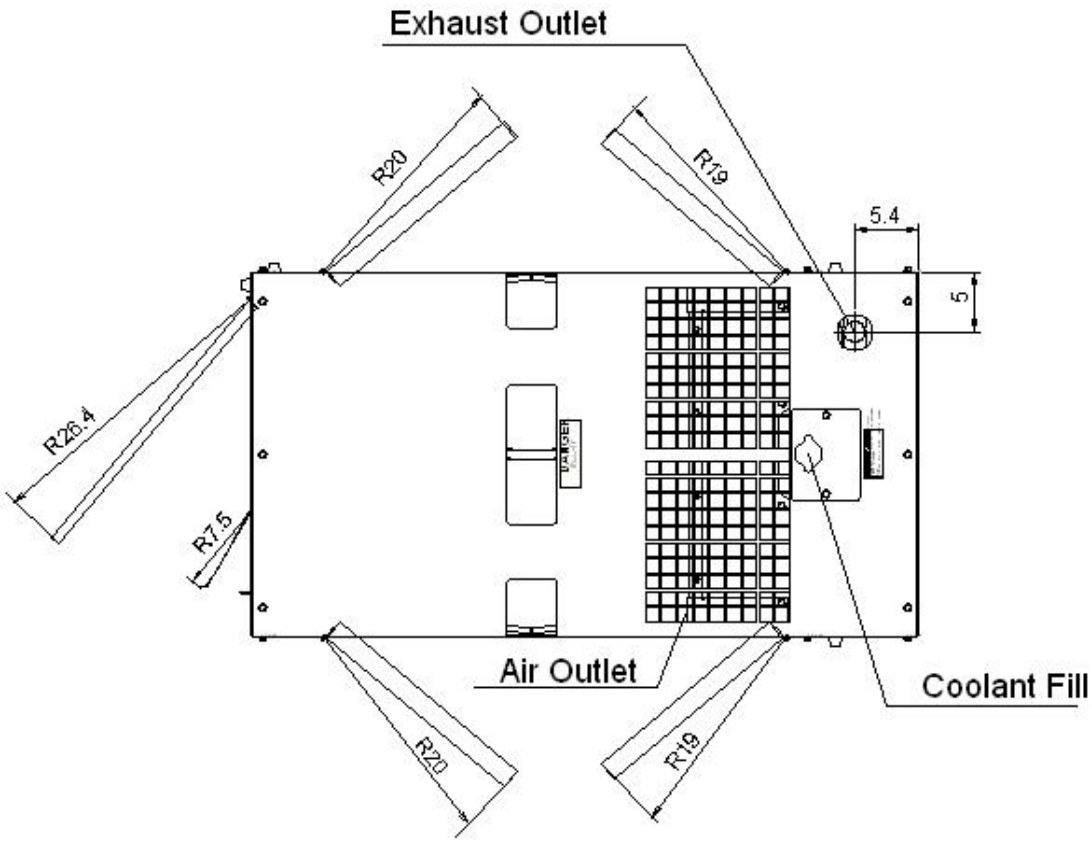


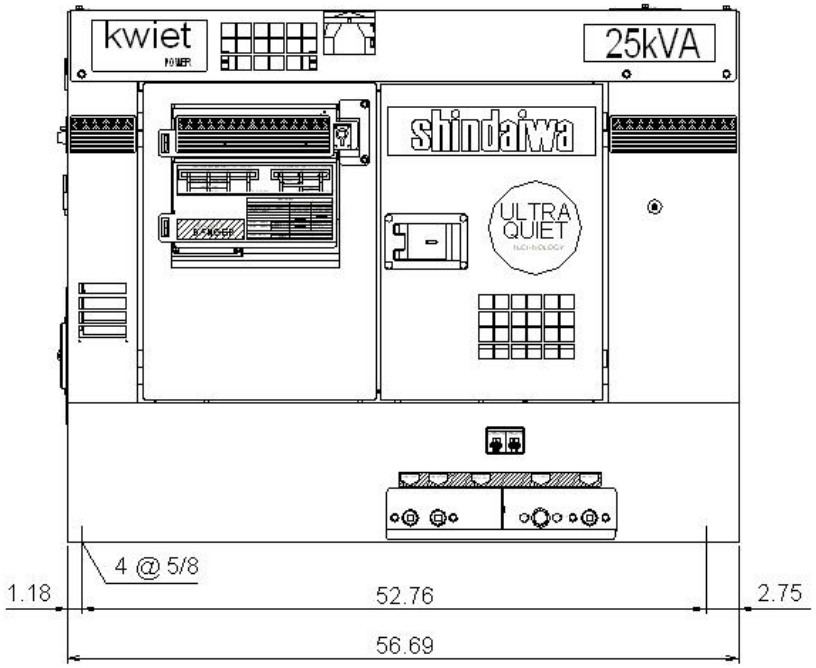
5.2 Outside View





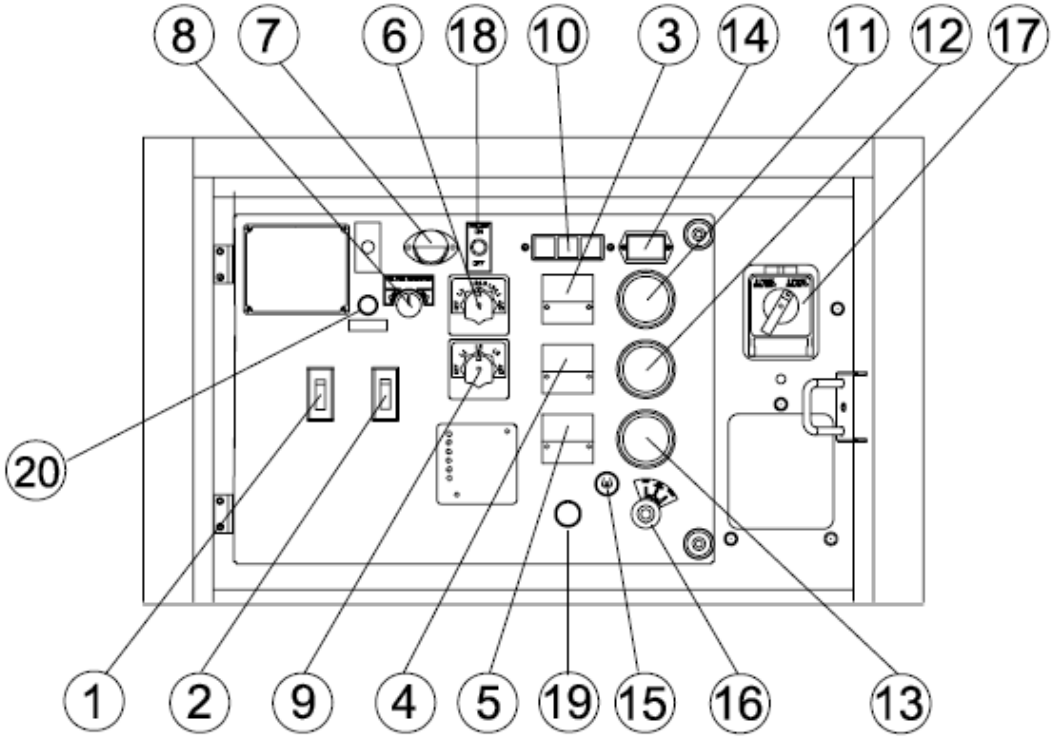
Units: Inches





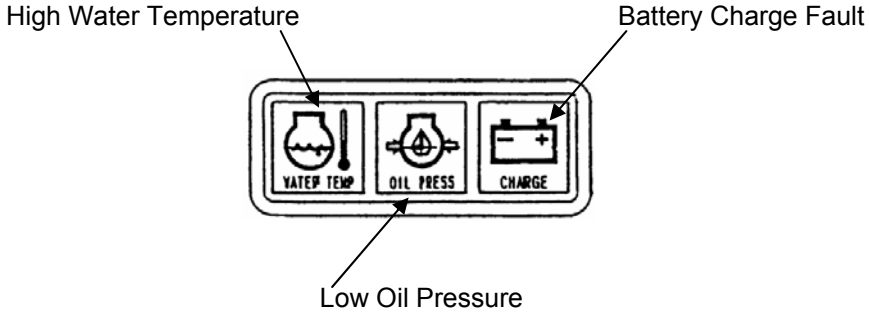
Units: Inches

5.3 Control Panel



- Component names are on the following page.

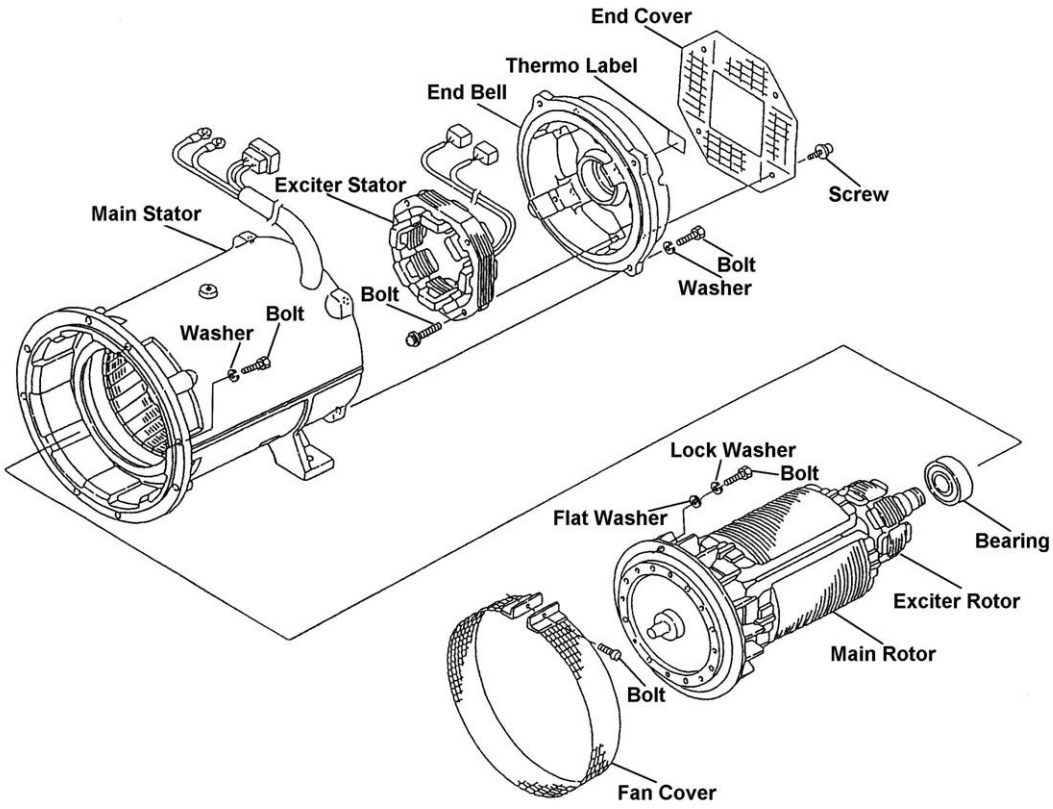
Detail Drawing of Warning Indicator



Number	Description
1	Three Phase Circuit Breaker
2	Single Phase Circuit Breaker
3	Voltmeter
4	Ammeter
5	Frequency Meter
6	Voltmeter Selector Switch
7	Panel Light
8	Voltage Adjust Rheostat
9	Ammeter Selector Switch
10	Warning Indicators
11	Coolant Temperature Gauge
12	Oil Pressure Gauge
13	Fuel Gauge
14	Hour Meter
15	Pre-heating Indicator
16	Ignition Switch
17	Voltage Selector Switch
18	Panel Light Switch
19	Emergency Stop Switch
20	Pilot Lamp

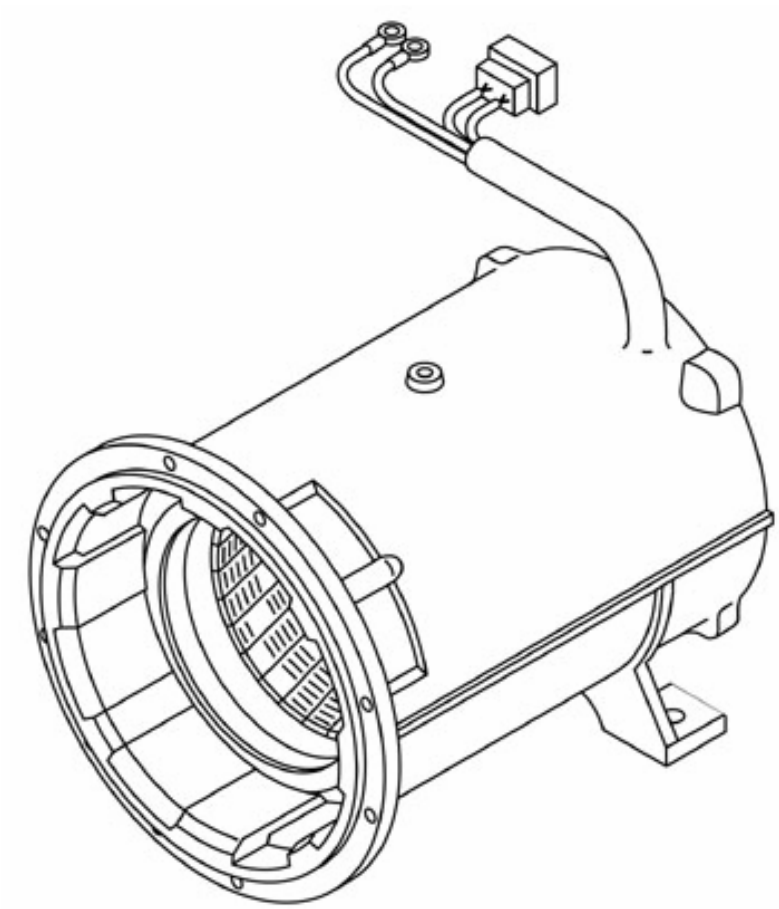
5.4 Generator

The generator is designed with a rigid cast stator for superior quality and exceptional durability. It includes a powerful damper winding that minimizes wave form distortion and maximizes motor starting capability.



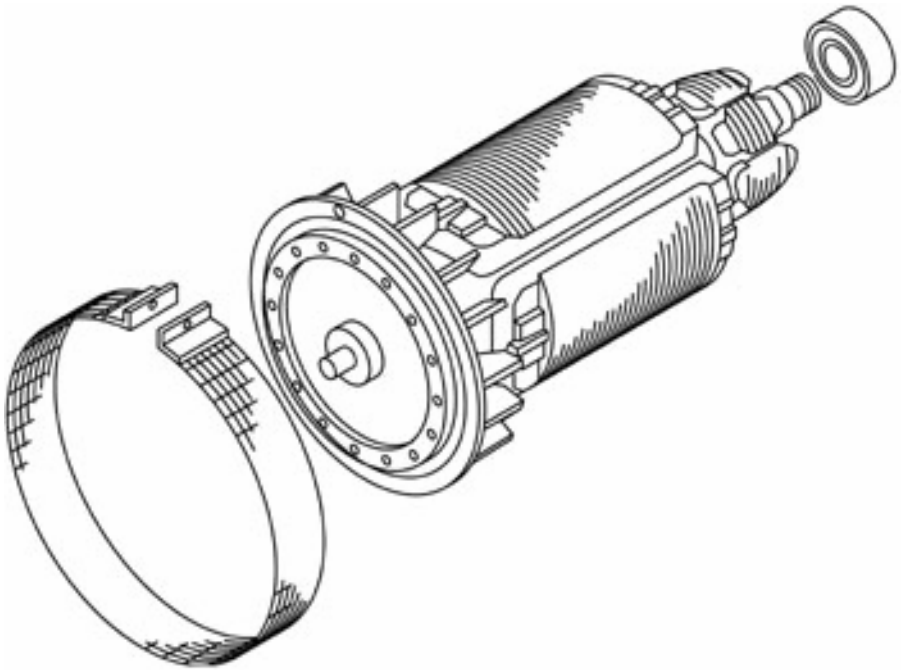
5.4.1 Stator

The stator is the external stationary portion of the generator that actually provides the electricity for distribution to the load. It is composed of several individual coils of copper wire distributed and wound such that the magnetic field associated with the rotor passes over and around the coils and in turn produces an electric potential (voltage) that is used as the supply voltage to the load. This stator also houses the stationary coils used as the exciter stator for the generator field exciter. The stator is bolted directly to the flywheel housing of the engine. The end bracket and end cover are bolted directly to the end of the stator opposite to where the stator is bolted to the flywheel housing.



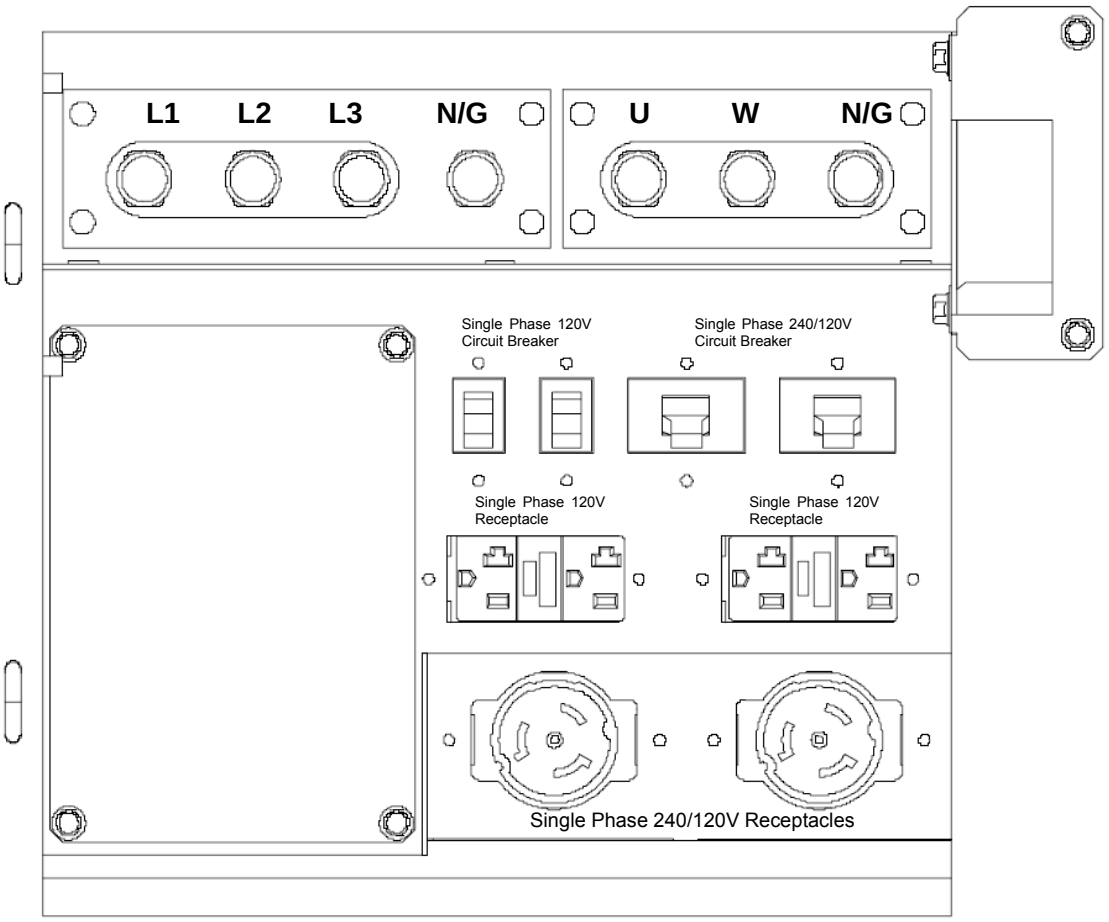
5.4.2 Rotor

The rotor is the portion of the generator bolted directly to the crankshaft of the engine so that it will rotate at the same speed that the engine crankshaft is rotating. The opposite end of the rotor is supported by the generator end bracket using a single ball bearing. The rotor has the field coils attached to it. The amount of current through the field coils determines the strength of the rotating magnetic field being used to generate a potential in the stator and therefore determines the output voltage of the generator. Field coil current is regulated by the exciter output, which is in turn regulated by the automatic voltage regulator. The rotating portion of the exciter is also mounted on the rotor.

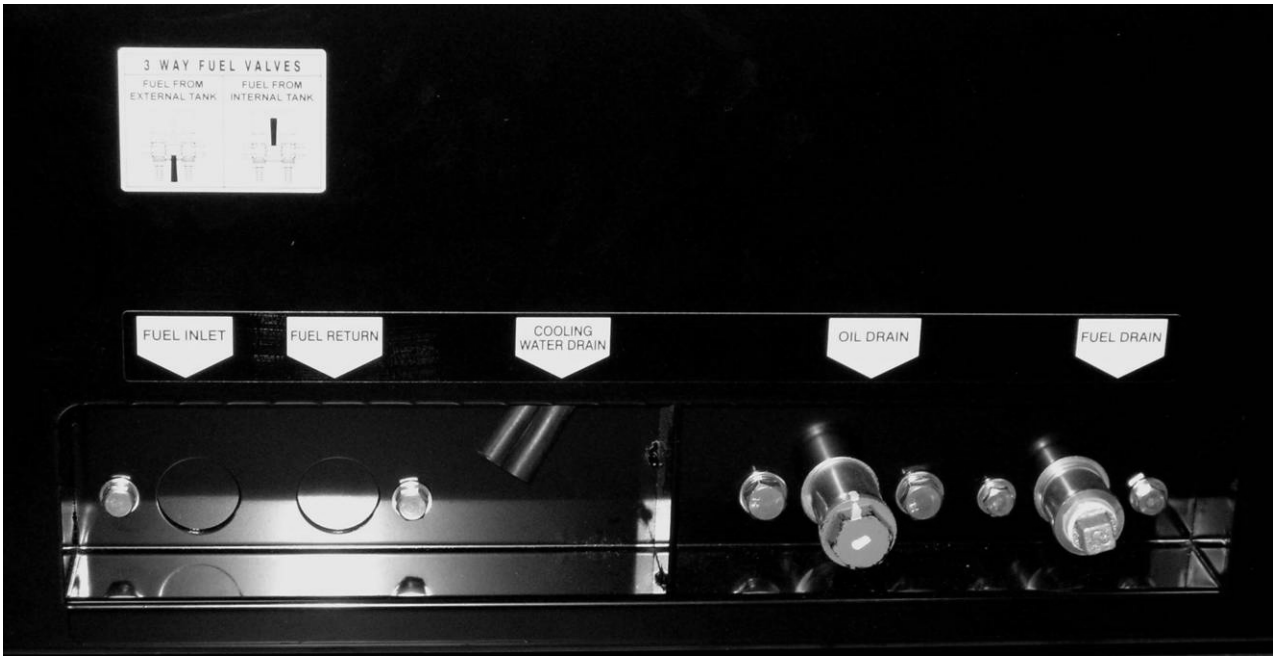


5.5 Receptacles and Main Terminals

Note: All duplex receptacles are GFCI circuit breaker protected and are rated at 20 amps. All twist lock receptacles are rated at 50 amps and are also circuit breaker protected.



5.6 Drain Plugs and External Fuel Connections



6. Equipment

6.1 Engine Control Circuit

Automatic Pre-Heating System
When the ignition switch is placed in the ON position the glow plugs and glow indicator are energized. Pre-heating time is based on coolant temperature. The glow time relay (QOS) detects the coolant temperature and if the temperature is between 5°F and 68°F pre-heating time is approximately 5 seconds. If the temperature is above 68°F the pre-heating time is approximately 2 seconds.

Control Power
When the ignition switch is placed in the RUN/PREHEAT position control power is supplied from the battery. The stop solenoid is energized and allows fuel flow to the injection pump.

Starting
When the ignition switch is placed in the START position, the starter motor is energized and cranks the engine to get the engine started. After the engine starts release the switch, and let it automatically return to the ON position.

Stopping
When the ignition switch is set to the STOP position, the stop solenoid is de-energized and shuts off fuel flow to the injection pump.

Protection

Over Current- When output amperage exceeds the rated current, the circuit breaker trips and the breaker handle will be positioned between ON and OFF. Move the handle to the OFF position to reset the breaker prior to re-closing it.

Low Oil Pressure- When lubricating oil pressure drops to 14 psi or less the emergency timer shuts down the engine.

High Coolant Temperature- When coolant temperature exceeds 230°F the emergency timer shuts down the engine.

Charging fault- If the battery charging system malfunctions, the charge indicator light will turn on but the engine will not shut down.

6.2 Monitors and Displays

The DGK25C diesel generator is equipped with monitoring functions for coolant temperature, oil pressure and battery charge condition.

Under normal operating conditions these monitoring lamps will illuminate momentarily when the engine is first started but will go out shortly thereafter.

If an abnormal condition is detected in the coolant temperature or oil pressure, the corresponding monitor lamp will flash and the automatic shutdown will be activated shutting down the engine. The battery charge light will cause only the light to flash.

If an automatic shutdown is activated, check for and correct the cause of the shutdown prior to trying to restart the generator set.

Coolant Temperature Monitoring Indicator

Warning

Injuries

- To avoid injuries by unintentional contact with the fan and/or fan belts, close and lock all doors while operating this equipment.

Burns

- To avoid sustaining burns from hot vapor, do not open the radiator cap while operating or immediately after stopping the equipment.
- Due to extremely high temperatures, do not come in contact with the engine and/or muffler while operating or immediately after stopping this equipment.

If the coolant temperature reaches 230°F during operation, the coolant temperature monitoring lamp will flash and automatically shut down the engine.

If this occurs, check the coolant reservoir tank level, and if low, replenish the coolant in the reservoir as needed with a 50:50 mix of water and Long Life Coolant (GM Spec 6277M or equivalent). **NEVER ADD COOLANT TO THE RADIATOR WHEN THE ENGINE IS HOT!!** After the engine cools down check for any coolant leaks and repair if needed.

CAUTION

- If the coolant level is too low the temperature sensor cannot detect the coolant temperature. Always check the coolant level in the radiator and coolant reservoir tank prior to operating this equipment.

Engine Oil Monitoring Indicator

If the engine oil pressure drops below 14 psi during operation, the oil pressure monitoring lamp will flash, and the automatic shutdown will activate. If this occurs, check the engine oil level, and fill to the maximum level if needed.

WARNING

Injuries

- To avoid injuries by unintentional contact with moving parts such as the cooling fan and/or belts, close and lock all doors while operating this equipment.

WARNING

Burns

- Due to extremely high temperatures, do not come in contact with the engine and/or muffler while operating or immediately after stopping this equipment.
- When checking or changing the engine oil, always stop the engine and allow sufficient time for the engine to cool down. Opening the oil filler cap during operation can cause injury due to hot oil.

CAUTION

- The oil pressure sensor cannot detect engine oil degradation due to extended use. Oil change intervals listed under the Periodic Maintenance Table must be strictly adhered to.

Battery Charge Monitoring Indicator

Insufficient battery charging during operation will cause the battery charge light to flash. If this occurs, check the condition and tightness of the fan belt and replace or tighten if necessary. This light is an indicator that the charging system is not working properly and possibly the battery charging alternator has insufficient output to keep the battery charged. Further testing may be required by a skilled technician.

CAUTION

- If the belt needs to be replaced refer to the Engine Workshop Manual.
- The battery charge light cannot detect the degradation of battery life or the battery fluid level.

6.3 Meters and Gauges

Hour Meter
The hour meter keeps track of the total run time of the engine. This meter should be used to schedule preventive maintenance. **Note:** The hour meter will continue to operate as long as the ignition switch is in the on position regardless if the engine is running or not.

Water Temperature Gauge
The water temperature gauge displays the temperature of the engine coolant. Normal operating temperature will vary between 176°F to 203°F depending on load and ambient temperature.

Oil Pressure Gauge
The oil pressure gauge indicates the pressure of the engine oil. Normal operating pressures may vary depending on conditions but should display between 40 psi and 60 psi. In colder climates the oil pressure gauge may read higher at start up due to the viscosity of the engine oil. Allow the engine to warm up until a normal reading is obtained prior to loading the generator.

Fuel Gauge
The fuel gauge indicates the level of fuel in the internal tank only. If an external fuel tank is being used the fuel gauge will not indicate the fuel level in the external tank.

Volt Meter
The volt meter displays the phase to phase output voltage of the generator. The displayed phase voltage will be dependant on the position of the voltmeter selector switch.

Ammeter
The ammeter displays the electrical output current from the generator. The displayed phase current output will be dependant on the position of the ammeter selector switch.

Frequency Meter
The frequency meter will display the frequency of the generated power.

6.4 Lamps and Lights

Glow Lamp
When the ignition switch is turned to the run/preheat position the glow lamp will illuminate. The glow lamp will stay lit until the preheat cycle is completed. This indicates that the engine is now ready to start. The preheat cycle time will depend on ambient and engine temperatures and may vary from 1- 5 seconds.

Pilot Lamp
The pilot lamp indicates whether or not power is being produced when the engine is running. When the pilot light is illuminated the engine is running and there is power being produced. When the pilot lamp is not illuminated and the engine is running then there is no power being produced and it indicates a problem with the generator system.

Panel Light
The panel light is used to illuminate the generator control panel. This light can be turned on and off with the toggle switch that is located to the right of the panel light. The panel light will operate only when the ignition switch is in the ON position. This prevents discharging the battery if the switch is left on and the generator is not running.

6.5 Switches

Ignition Switch
The ignition switch is a three position switch used for starting, stopping and preheating the engine.

Positions:

Stop: When the switch is placed in this position all power will be turned off. The switch must be in this position to remove the key.
Run/Preheat: The switch must be in this position during operation. When the switch is placed in this position the engine preheat cycle commences. This switch position is also used to remove air from the fuel system.
Note: Do not leave the switch in this position if the engine is not running because the hour meter will continue to operate until the battery is completely discharged.
Start: This position energizes the starter motor which cranks the engine to get it started. The switch will automatically return to the run/preheat position when the key is released. **Note:** Do not hold the switch in this position after the engine starts or starter damage may occur.

Emergency Stop Switch
The emergency stop switch is located directly to the left of the ignition switch. It is a red button type switch that when pushed in will cause the engine to immediately stop. It will remain pushed in until manually reset by pushing it again.

Voltmeter Selector Switch
The voltmeter selector switch is a 5 position switch located on the control panel to the left of the voltmeter. The voltmeter selector switch selects which phase voltage is displayed on the voltmeter.

Positions:

Off: There are two off positions on the voltmeter selector switch. One at the full clockwise position and one at the full counter-clockwise position of the switch. In either off position the voltmeter will not display any voltage.
L1-L2: In the L1-L2 position the voltmeter will display the phase voltage between L1 and L2.
L2-L3: In the L2-L3 position the voltmeter will display the phase voltage between L2 and L3.
L3-L1 / U-W: In the L3-L1 / U-W position the voltmeter will display the phase voltage between L3 and L1 and U and W phase voltage.

Ammeter Selector Switch
The ammeter selector switch is a 5 position switch located on the control panel to the left of the ammeter. The ammeter selector switch selects which phase current is displayed on the ammeter.

Positions:

Off: There are two off positions on the ammeter selector switch. One at the full clockwise position and one at the full counter-clockwise position of the switch. In either off position the ammeter will not display any amps.
L1 / U: In the L1 / U position the ammeter will display the total phase current for L1 plus the phase current of U.
L2: In the L2 position the ammeter will display the phase current for L2.
L3 / W: In the L3 / W position the ammeter will display the total phase current for L3 plus the phase current of W.

6.6 Output Circuit Breakers

The DGK25C has two main output circuit breakers located on the left side of the control panel that are used to connect the generator output to the main terminals. The three phase circuit breaker is for connecting and disconnecting the load on terminals L1, L2 and L3. The single phase circuit breaker is for connecting and disconnecting the load on the U and W terminals. Turning the circuit breaker on will enable power to flow to the main terminals. Turning the circuit breaker off will disconnect power to the main terminals. These breakers will both trip in the event of an overload condition on the generator or if the terminal box cover is opened while the engine is running.

6.7 Voltage Adjust Rheostat

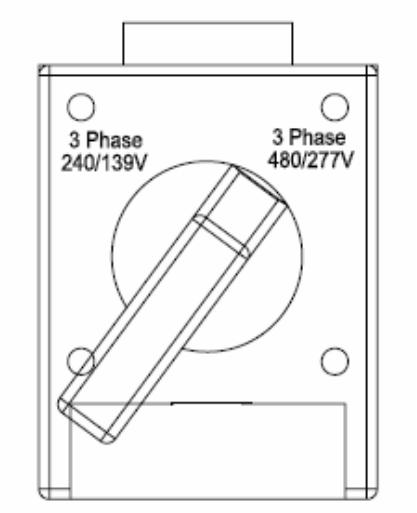
The voltage adjust rheostat is used to adjust the generated output voltage of the generator. Turning the voltage adjust rheostat clockwise will increase the output voltage and turning the voltage adjust rheostat counter-clockwise will decrease the voltage. The adjustable range available for voltage adjustment is plus 5% and minus 15%.

6.8 Voltage Selector Switch

Voltage Selector Switch
The voltage selector switch is a 2 position lockable switch located on the right side of the control panel. This switch provides a quick and convenient method of changing the generator output voltage. **Note: This switch should <u>NEVER</u> be changed while the generator is running or serious damage may occur!**

Positions:

3 Phase 480/277: The 3 phase 480/277 position gives an output from the generator of 480 volts 3 phase and 277 volts single phase at the 3 phase terminal board and 120 or 240 volts at the single phase terminal board.
3 Phase 240/139: The 3 phase 240/139 position gives the output from the generator of 240 volts 3 phase and 139 volts single phase at the 3 phase terminal board and 120 or 240 volts at the single phase terminal board.



Voltage Selector Switch

6.9 3 Way Fuel Valve

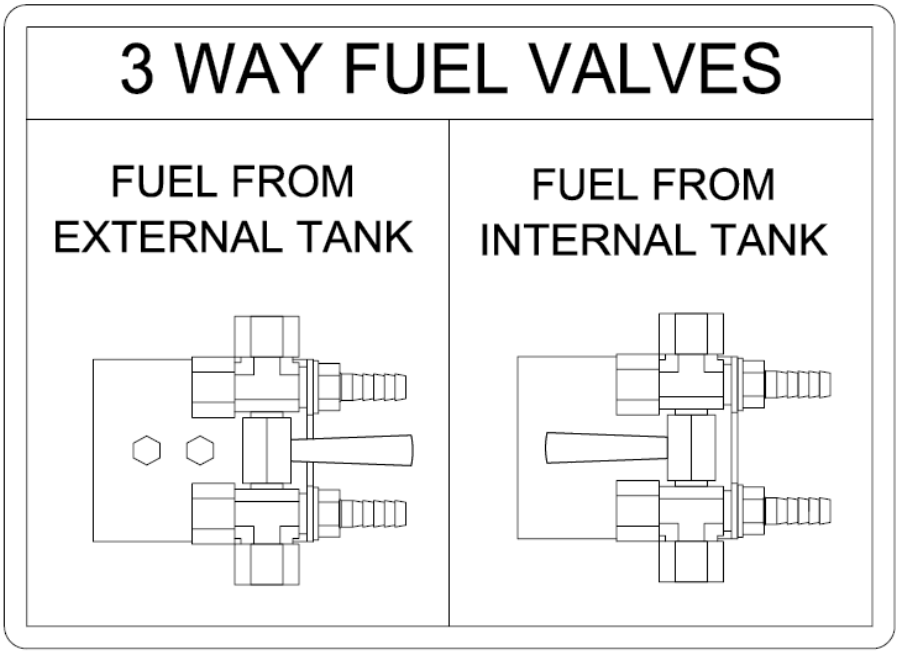
The 3 way fuel valve is located inside the enclosure on the right side of the engine. This valve provides a quick and convenient method of attaching an external fuel tank for supplying fuel to the engine. The 3 way valve comes from the factory in the A position which provides fuel from the internal fuel tank to the engine.

Positions:

Position A: When using an external fuel tank for the fuel supply to the engine, remove the 3/8" pipe plugs, connect the fuel lines from the external tank to the appropriate inlet and return port fittings and then set the 3 way valve to position A. **Note:** The internal fuel tank will not supply fuel to the engine when in position A.
Position B: When using the internal tank for the fuel supply to the engine, set the 3 way valve to position B. In position B the fuel for the engine is supplied by the internal fuel tank. **Note:** Always ensure external fuel ports are plugged with the supplied 3/8" pipe plug fittings when the 3 way valve is in position B.

⚠ CAUTION

- Always stop the engine prior to performing any work on the fuel system or fuel lines.
- Immediately clean up any fuel leakage.



Position A **Position B**

7 Lifting, Transporting, and Installing

7.1 Lifting

⚠ WARNING

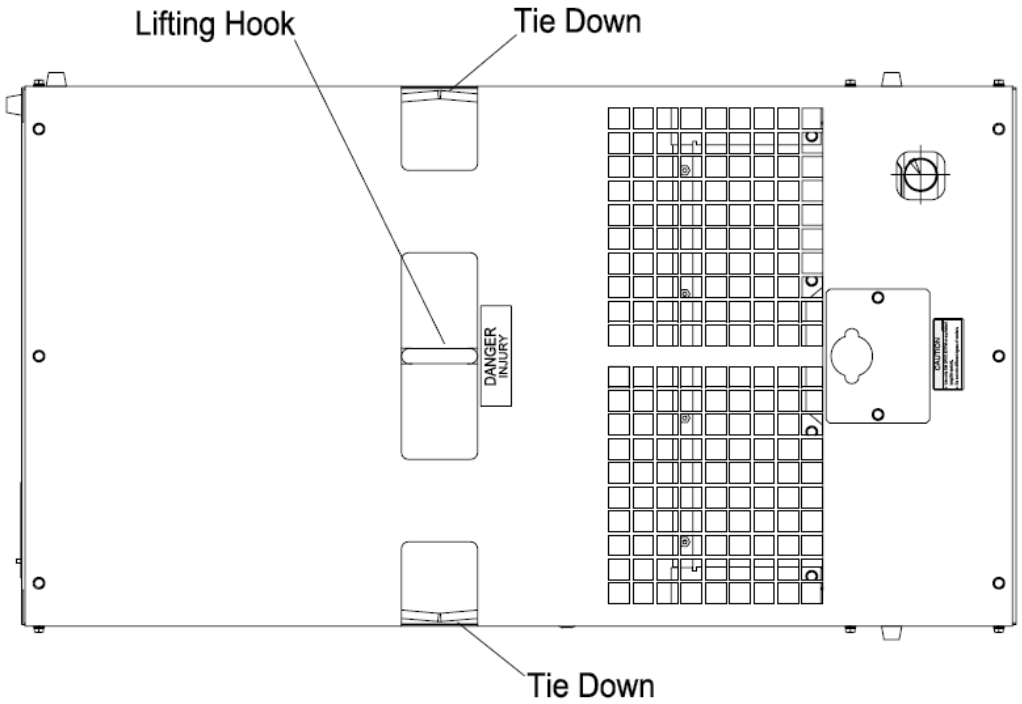
- The lifting hook is designed to lift only the weight of the generator. Do not lift any additional added weight such as fuel tanks and/or trailers with the lifting hook.

⚠ CAUTION

- Use only the installed lifting hook for lifting the equipment.
- Do not use the tie down posts for lifting as they are not designed to hold the weight of the equipment.

Always use the installed lifting hook whenever lifting this equipment.

Note: The lifting hook is designed to lift only the weight of the generator. Do not lift any additional weight such as a fuel tank and/or trailer with the lifting hook. Do not lift with the tie downs.



7.2 Transporting

⚠ WARNING

- Always use extreme caution when loading, unloading or transporting this equipment. Failure to do so may result in personal injury or death and/or damage to the equipment.

When transporting this equipment, ensure that the equipment is properly secured using the tie down posts.

7.3 Installing

⚠ WARNING

Suffocation from exhaust gases:

- Exhaust fumes from the engine contain many elements that have been proven to be harmful to humans. Do not operate this equipment in poorly ventilated areas such as inside buildings or in tunnels.
- Do not direct the exhaust fumes towards pedestrians or buildings.

⚠ CAUTION

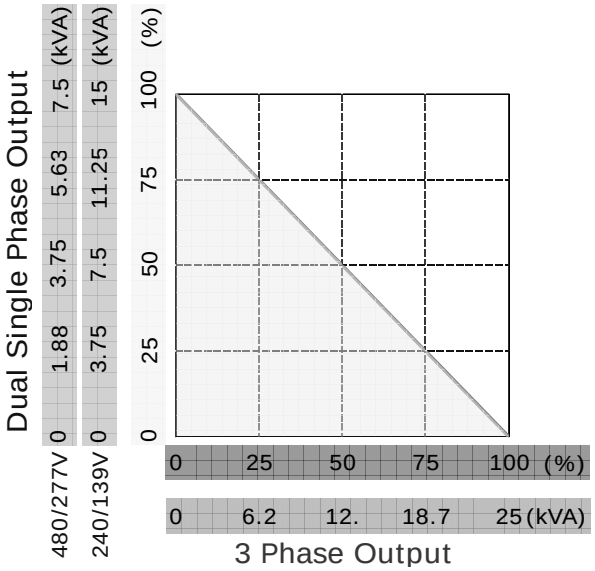
Fire:

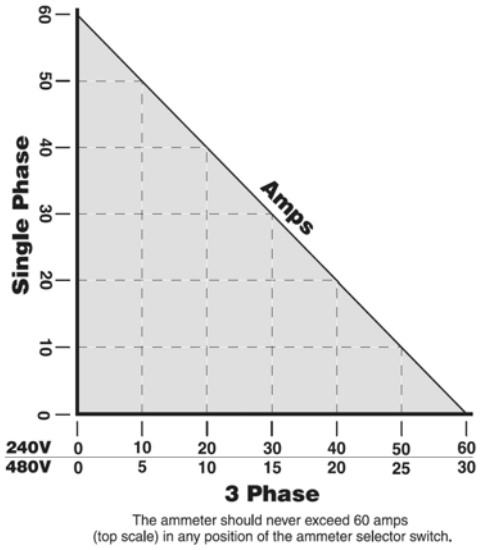
- Operate this equipment only on flat surfaces and at least 3 feet away from any objects, such as walls, as overheating may occur due to lack of air flow.
- Temperatures around the muffler and exhaust system can get extremely hot. Keep all flammable items away from this equipment during and immediately after operation.

- Always place this equipment on a hard, flat and level surface.
- Keep the equipment at least 3 feet away from any obstruction that might restrict the air flow to the exhaust or radiator cooling air. Failure to do so may result in a reduction in engine performance, overheating and/or damage to the equipment.
- Operating the equipment in dusty or other harsh environments may result in a clogged radiator or air filter element and may result in overheating. Be sure to check the radiator, air filter element, fuel filter, and electrical terminal blocks on a daily basis and in some cases more often when operating it in a harsh environment.

8. Simultaneous Three Phase and Dual Voltage Single Phase Output

When using three phase and simultaneous dual voltage single phase output the load must be properly balanced so as not to overload the generator. The charts below show that when the three phase load is increased the available single phase output is decreased and vice versa. Use the ammeter selector switch to check the amperage flow in all settings. The ammeter should never exceed 60 amps (top scale) in any one position. When the ammeter selector switch is in the U-L1 position the ammeter will display the combined amperage of both single phase line U and three phase line L1. In the W-L3 position the ammeter will display the combination of single phase line W and three phase line L3. For example, with the voltage selector switch in the 240/139V position and the dual single phase load is 7.5 kVA (30 amps) then the available three phase output will be 12.5 kVA (30 amps).




Single Phase
Amps
0 10 20 30 40 50 60
240V 0 10 20 30 40 50 60
480V 0 5 10 15 20 25 30
3 Phase
The ammeter should never exceed 60 amps
(top scale) in any position of the ammeter selector switch.

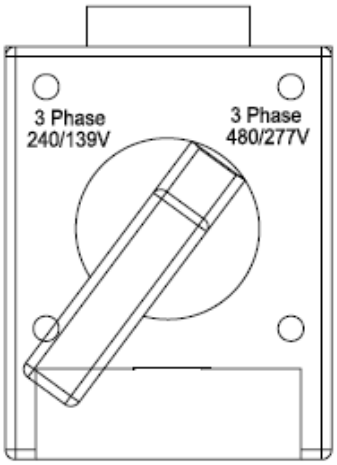
9. Connecting Cables

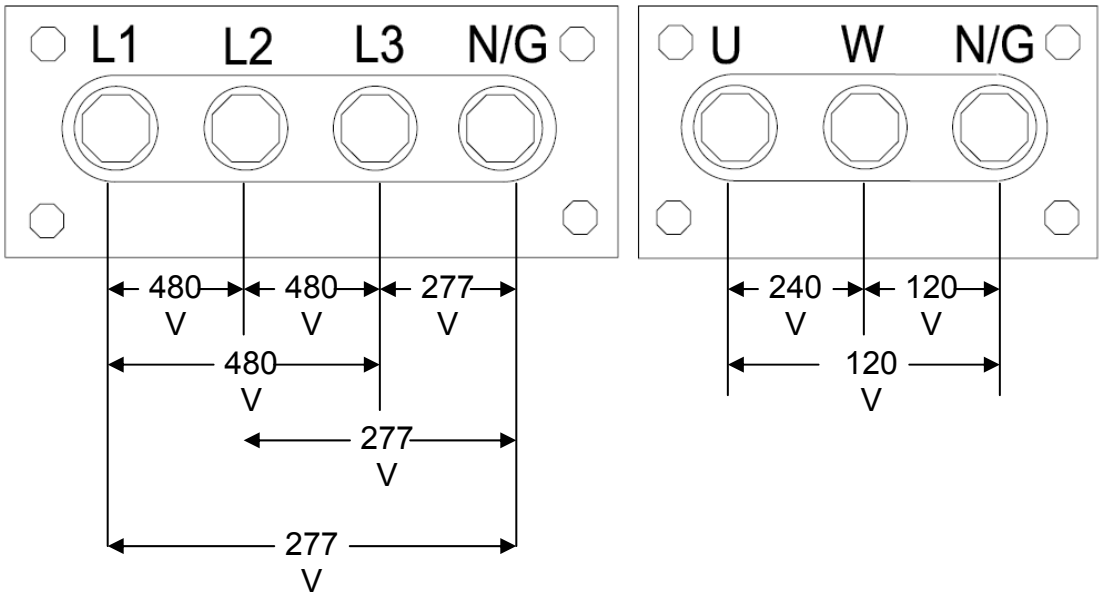
9.1 Main Terminal Connections 480/277V Position

⚠ WARNING

Electric Shock

- Before connecting or disconnecting the load cables from the output terminals, always turn the output circuit breakers to the OFF position, stop the engine, and remove the ignition key. The person performing the connection or disconnection should always have possession of the key.



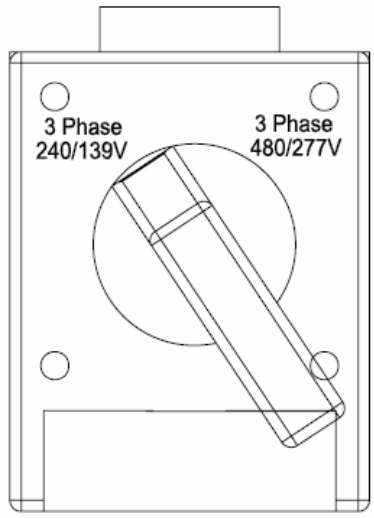


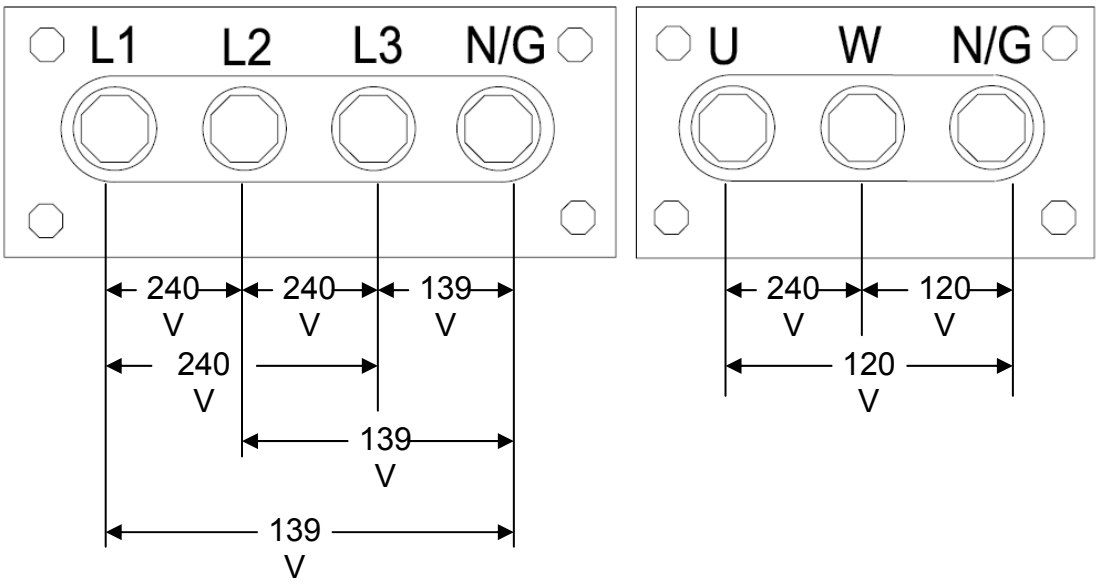
9.2 Main Terminal Connections 240/139V Position

⚠ WARNING

Electric Shock

- Before connecting or disconnecting the load cables from the output terminal, always turn the output circuit breakers to the OFF position, stop the engine, and remove the ignition key. The person performing the connection or disconnection should always have possession of the key.





10. Generator Technical Specifications

Items			Reference Value	Notes
Insulation		Armature Winding	3 MΩ or more	DC 500V
		Exciter Field	3 MΩ or more	Meg Ohm Tester
Pre-Heating Time			5 seconds: Coolant temperature between 5°F and 68°F	Automatic pre-heating system
			2 seconds: Coolant temperature is greater than 68°F	
High Idling Speed			50HZ: up to 1575 rpm	Within 5%
			60 HZ: up to 1890 rpm	
Lubricating Oil Pressure			14.5 to 71 psi	
Coolant Temperature			158°F to 218°F (70°C to 100°C)	
Engine Speed Droop		Transient Deviation	Within 10%	Full Load to No Load
		Steady State Deviation	Within 5%	
Voltage Regulation		Transient Deviation	Within 20%	Full Load to No Load
		Steady State Deviation	Within ±1%	
Protective Devices	Low Oil Pressure	Working Pressure	14 psi (1.0±0.2 kgf/cm^2)	Closed When Activated
		Part Number (Isuzu)	982720-0690	
	High Water Temperature	Working Temperature	230°±4°F (110°±2°C)	Closed When Activated
		Part Number (Isuzu)	894132-3310	

11. Initial Startup and Pre-Checks

WARNING

Electrical Shock

- Before performing any equipment checks or maintenance, stop the engine, and remove the engine key. The person performing the equipment checks or maintenance should always have possession of the key.

CAUTION

Burns

- To avoid sustaining burns from hot vapors, do not open the radiator cap while operating or immediately after stopping this equipment
- Due to extremely high temperatures, do not touch the engine or exhaust system while operating or immediately after stopping this equipment.
- When checking or changing the engine oil, stop the engine, and wait until the engine cools down before removing the engine oil level dipstick or opening the oil fill cap. Removing the engine oil level dipstick or opening the oil fill cap during or immediately after operation may cause injury due to hot oil.

Fire

- Immediately wipe up any diesel fuel or engine oil that is spilled. Do not use this equipment if there are any leaks. If leaks are found, repair the leak before further use.

11.1 Checking Engine Oil

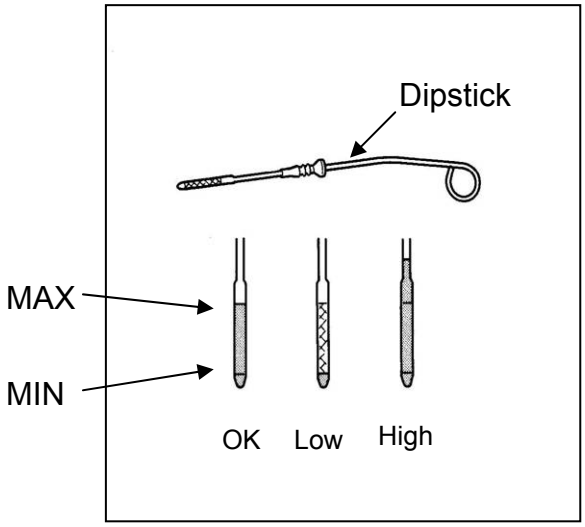
(Also refer to the accompanying Engine Instruction Manual)
When checking the engine oil, be sure to keep the equipment level and insert the dipstick fully.

Prior to starting the engine, make sure to fill the engine oil to the MAX line through the oil filler opening.

⚠ CAUTION

- If the equipment is not level, you cannot obtain an accurate oil level reading.
- Do not overfill the engine with oil as this may result in damage to the engine.

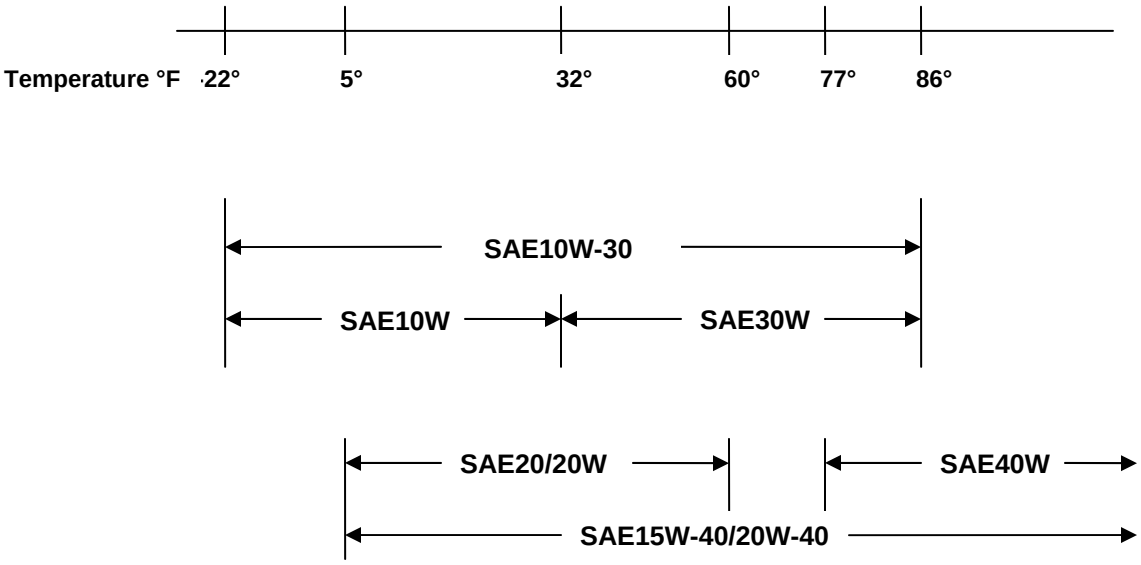
1. Remove the dipstick from the crankcase and wipe it clean with a clean cloth.
2. Reinsert the dipstick fully and gently remove it again.
3. Check the oil level on the dipstick. The level must be between the Max level mark and the Min level mark.
4. If the level is above the Max mark, drain oil out until the level is between the Max and Min marks.
5. If the level is at or below the Min level mark, add oil until the level is between the Max and Min marks.



11.2 Selecting the Proper Engine Oil

Use engine oil specifically designed for diesel engines. Use the chart below to determine the proper viscosity of oil to use for the anticipated ambient temperature the equipment will be operated in.

Oil Viscosity and Temperature



⚠ CAUTION

- Use only API class CD grade or higher engine oil.

11.3 Checking for Leaks

Prior to starting the engine, make sure a complete and thorough inspection is performed to check for any leaks.

⚠ CAUTION

- Do not use this equipment if a leak is detected. Repair the leak before further use.
- Always check closely around hoses and fittings for signs of leaks.

11.4 Checking Engine Coolant

*(*Also refer to the accompanying Engine Instruction Manual)

WARNING

Injuries

- Before performing any equipment checks or maintenance, stop the engine, and remove the engine key. The person performing the equipment checks or maintenance should always have possession of the key.

CAUTION

Burns

- To avoid sustaining burns from hot vapors, do not open the radiator cap while operating or immediately after stopping this equipment.
- Due to extremely high temperatures, do not touch the engine or exhaust system while operating or immediately after stopping this equipment.
- When checking or changing the engine oil, stop the engine, and wait until the engine cools down before removing the engine oil level dipstick or opening the oil fill cap. Removing the engine oil level dipstick or opening the oil fill cap during or immediately after operation may cause injury due to hot oil.

Fire

- Immediately wipe up any diesel fuel or engine oil that is spilled. Do not use this equipment if there are any leaks. If leaks are found, repair the leak before further use.

Procedure for Checking Radiator Coolant Level:

1. Remove the radiator access plate on top of the enclosure.
2. Loosen the thumb screw for the radiator cap access door.
3. Remove the radiator cap and check the level of the coolant. The coolant level should be up to the filler neck. If the level is low, add a 50:50 mix of Long Life Coolant (GM SPEC 6277M or equivalent) until the level is at the filler neck.
4. Reinstall the radiator cap, install the radiator access door and reinstall the radiator access plate.

Procedure for Checking the Coolant Reservoir Level:

1. Open the enclosure door to gain access to the reservoir.
2. The coolant level should be between the Min and Max line. If the coolant level is low, add a 50:50 mix of Long Life Coolant (GM SPEC 6277M or equivalent) and water until the level is between the Min and Max line.

CAUTION

- Always use potable water when mixing the coolant.
- Coolant is combustible. Do not spill any coolant on the exhaust or hot engine parts.

11.5 Checking the Fan Belt

(Also refer to the accompanying Engine Instruction Manual)

WARNING

Injuries

- Before performing any equipment checks or maintenance, stop the engine, and remove the engine key. The person performing the equipment checks or maintenance should always have possession of the key.
- To avoid injuries by unintentional contact with the cooling fan or fan belt, close and lock all doors while operating this equipment.

CAUTION

Burns

- Due to extremely high temperatures, do not come in contact with the engine and/or muffler while operating or immediately after stopping this equipment.

Procedure for Checking the Fan Belt and Fan Belt Tension:

1. Gain access to the alternator side of the engine.
2. The fan belt should have ¼ to ½ inch of slack when applying finger pressure on the belt between the alternator and water pump pulley.
3. Check the condition of the belt. If the belt is cracked or damaged replace the fan belt before operating this equipment. The procedure for replacing the fan belt can be found in the accompanying Engine Instruction Manual.
4. If the belt is loose refer to the Engine Instruction Manual for the tightening procedure.

11.6 Checking the Fuel Level

Prior to starting the engine, check the fuel level in the tank that is supplying fuel to the engine. The fuel gauge on the control panel will display only the fuel level for the internal fuel tank. Always use the fuel strainer installed in the fuel fill pipe when refueling.

⚠ **CAUTION**

Fire

- Immediately wipe up any diesel fuel or engine oil that is spilled.
- Do not use this equipment if there are any leaks. If a leak is found, repair the leak before further use.
- Fill the fuel tank slightly below the Full mark to allow for expansion of the fuel.

⚠ **CAUTION**

- The fuel injector pump, injectors and other parts of the fuel system and engine can be damaged if any fuel or fuel additives are used other than those specifically recommended by the engine manufacturer.
- Refer to the Engine Instruction Manual for the recommended fuels.

11.7 Checking the Battery

Procedure:

1. Check the battery fluid level. If the level is at or near the lower level mark, fill with distilled water to the upper level mark.
2. Make sure the battery terminal connections are tight and free of corrosion.
3. Make sure the battery is securely mounted with the supplied bracket.

⚠ **CAUTION**

Injury

- Battery fluid contains diluted sulfuric acid. Avoid contact with eyes, skin or clothing. If contact with the acid does occur, especially with the eyes, immediately flush with large volumes of water and contact a physician immediately.

12. Operation

12.1 Starting the Generator

WARNING

Suffocation from exhaust gases:

- Exhaust fumes from the engine contain many elements that have been proven to be harmful to humans. Do not operate this equipment in poorly ventilated areas such as inside buildings or in tunnels.
- Do not direct the exhaust fumes towards pedestrians or buildings.

CAUTION

Injuries

- Always place the equipment on a flat, hard, level surface and at least 3 feet way from obstructions.
- Due to extremely high temperatures, do not touch the engine or exhaust system while operating or immediately after stopping this equipment.
- Before starting this equipment, turn the output circuit breakers to the OFF position.

Fire

- Immediately wipe up any diesel fuel or engine oil that is spilled. Do not use this equipment if there are any leaks. If leaks are found, repair the leak before further use.

Procedure:

1. Turn the three phase and single phase generator output circuit breakers to the OFF position.
2. If this is the first time starting the engine, refer to After Long Term Storage Starting Procedure on Page 60 of this manual.
3. Set the Voltage Selector switch to the desired three phase output voltage.
4. Turn the ignition key to the Preheat/Run position until the Glow Lamp Indicator turns off.
5. Turn the ignition key to the Start position and release it as soon as the engine starts. **Note: Do not hold the key in the Start position for more than 10 seconds or damage to the starter system may occur.** If the engine does not start, wait at least 30 seconds before attempting to start it again.
6. Once the engine starts, check to make sure all monitoring lamps are not lit.
7. Allow the engine to run, with no load, for at least 10 minutes prior to closing the main circuit breakers.

WARNING

Electric Shock:

- Before connecting or disconnecting the load cables from the output terminals, always turn the output circuit breakers to the OFF position, stop the engine, and remove the ignition key. The person performing the connection or disconnection should always have possession of the key.

12.2 Loading the Generator

Procedure:

1. Check that the output voltage is set for the desired voltage and adjust if necessary.
2. Close the generator output circuit breakers.

12.3 Operating the Generator

Procedure:

1. Make sure all monitoring lights remain off.
2. Check and make sure all gauges and meters are working properly.
3. Check for any unusual vibration or noise.
4. Check for any unusual color from the exhaust.
5. **NEVER change the voltage selector switch while the generator is running.**
6. If the output circuit breakers trip OFF, make the necessary corrections or repairs (or decrease the load) prior to resetting the breaker.
7. If a fault shuts the engine down, correct the fault before resuming operation.

12.4 Stopping the Generato*r*

Procedure:

1. Turn the load circuit breakers to the OFF position.
2. Turn the generator output circuit breakers to the OFF position.
3. Allow the engine to run unloaded for at least 3 minutes.
4. Turn the ignition key to the Stop position.

CAUTION

- The electric fuel pump continues to operate whenever the key is in the run position even if the engine is not running.

13 General Maintenance

13.1 Engine Maintenance

WARNING

Electrical Shock

- Before performing any equipment checks or maintenance, stop the engine, and remove the ignition key. The person performing the equipment checks or maintenance should always have possession of the key.

CAUTION

Burns

- To avoid sustaining burns from hot vapors, do not open the radiator cap while operating or immediately after stopping this equipment
- Due to extremely high temperatures, do not touch the engine or exhaust system while operating or immediately after stopping this equipment.
- When checking or changing the engine oil, stop the engine, and wait until the engine cools down. Removing the engine oil level indicator or opening the oil fill cap during or immediately after operation may cause injury due to hot oil.

Fire

- Immediately wipe up any diesel fuel or engine oil that is spilled. Do not use this equipment if there are any leaks. If a leak is found, repair the leak before further use.

To maximize the useful life of this generator, follow the recommended periodic maintenance schedule and maintenance checks according to the following table. The hour meter should be used as a guide to schedule the maintenance and checks.

13.2 Periodic Maintenance Table

Description	Daily	50 Hrs	200 Hrs	400 Hrs	500 Hrs	1000 Hrs
Engine						
Engine Oil (Check/Add)	O					
Engine Oil (Replace) (1st time at 50 Hrs)		O	O			
Oil Filter (Replace) (1st time at 50 Hrs)		O		O		
Coolant (Check/Add)	O					
Coolant (Change/Radiator Flush)						O
Pre-Filter Bowl (Clean/Drain Water)	O					
Main and Pre-Fuel Filter (Replace)					O	
Fuel Tank (Drain Water)			O			
Fuel Tank (Clean)						O
Fuel Hoses (Replace)						O
Check for Leaks (Fuel/Oil/Coolant)	O					
Air Cleaner Element (Inspect/Clean)	O					
Air Cleaner Element (Replace)					O	
Battery Fluid (Level/Specific Gravity Check)	O					
Fan Belt Tension (Check)	O					
Wiring and Connections (Check)	O					
Inspect and Clean All Terminal Boards			O			
Radiator (Clean)					O	
Fuel Injector Nozzle Tip (Check)					O	
Exhaust Color (Check)	O					
Valve Clearance (Check/Adjust)						O
Compression (Check)						O
Fuel Injection Nozzle Pressure (Check)						O
Fuel Injection Timing (Check)						O
Generator						
Indicators, Gauges, Alarms (Check)	O					

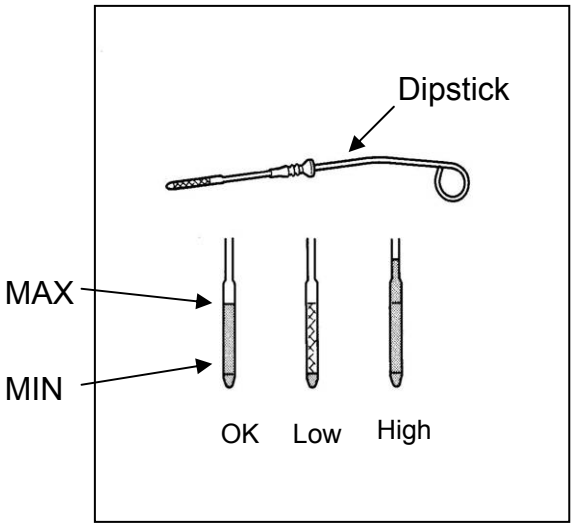
13.3 Changing Oil

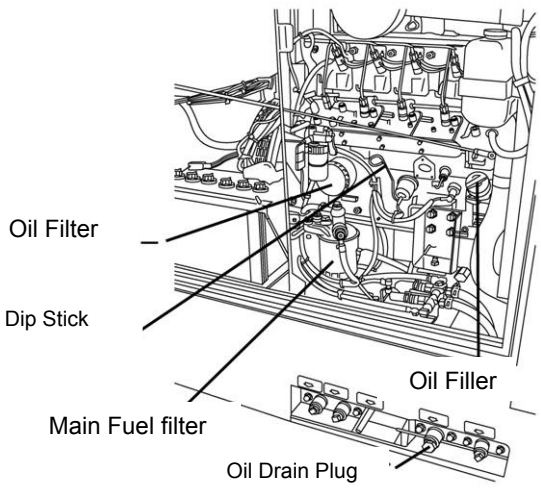
Frequency:

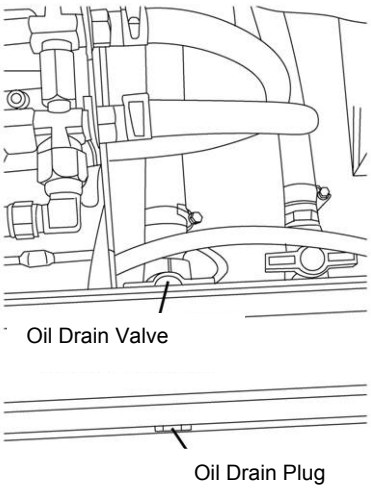
First Time	50 Hours
Thereafter	Every 200 Hours

Procedure:

1. Clean the area around the oil fill cap to prevent the entry of foreign material.
2. Remove the oil fill cap.
3. Remove the engine oil drain plug. Turn the ball valve just inside the enclosure counterclockwise to open the valve and allow the oil to drain completely.
4. Turn the ball valve clockwise to shut the valve and then reinstall the oil drain plug and tighten.
5. Fill with new oil through the oil filler opening until the oil level is at the max line on the dipstick (approximately 2 gallons).
6. Reinstall the oil filler cap and tighten by hand.
7. Start the engine and check for any leaks.
8. Stop the engine, wait 20 minutes, and then recheck the engine oil level, with the dipstick. If necessary, add additional oil to bring the level to the max line on the dipstick.







⚠ CAUTION

- Use only engine oil designated API, CD grade or higher.
- Refer to Engine Instruction Manual for recommended oil viscosity.

13.4 Replacing the Oil Filter

Frequency:

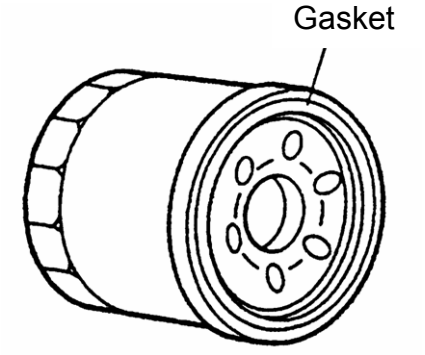
First Time	50 Hours
Thereafter	Every 400 Hours

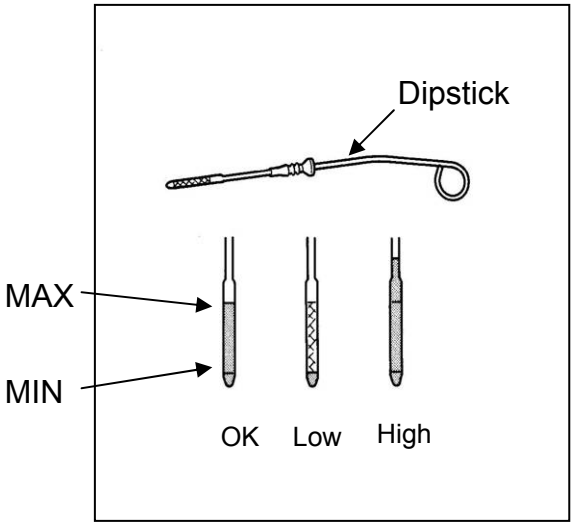
Procedure:

1. Clean the area around the oil filter and oil filler cap to prevent entry of foreign material.
2. Remove the oil fill cap.
3. Remove the engine oil drain plug and turn the ball valve just inside the enclosure counterclockwise to allow the oil to drain completely.
4. Turn the ball valve clockwise to shut the valve and then reinstall the oil drain plug and tighten.
5. Using an oil filter wrench, loosen and remove the oil filter.

(Continued on the next page)

6. Lightly coat the rubber gasket on the new oil filter with new engine oil.
7. Install the new oil filter until the rubber gasket makes contact with the sealing face.
8. Use an oil filter wrench to tighten the oil filter an additional ¾ turn.
9. Fill with new oil, through the oil filler opening, until the oil level is at the max line on the dipstick (approximately 2 gallons).
10. Reinstall the oil filler cap and tighten by hand.





⚠ CAUTION

- Use only engine oil designated API, CD grade or higher.
- Refer to Engine Instruction Manual for recommended oil viscosity.

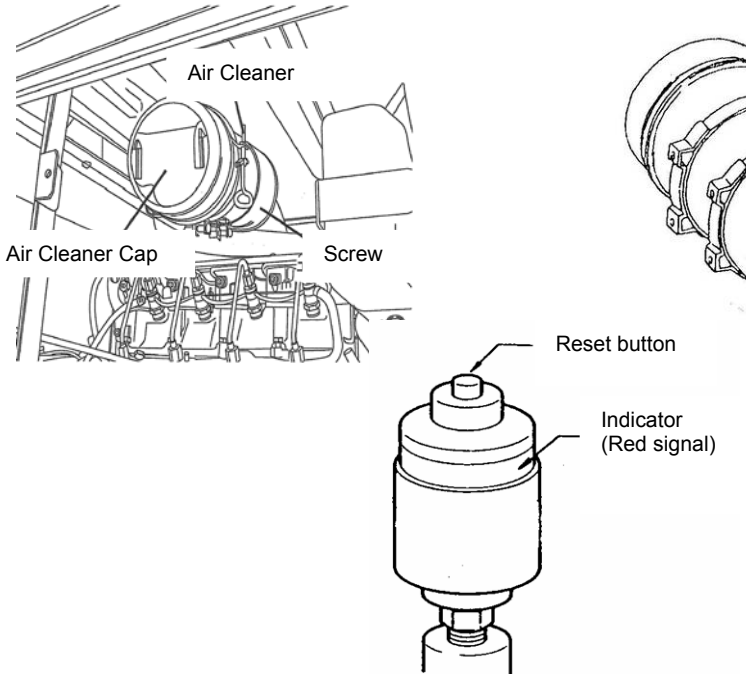
13.5 Cleaning/Replacing the Air Filter Element

Frequency:

Inspect/Clean	Daily
Replace	Every 500 Hours

Procedure:

1. Unscrew the retaining ring wing nut for the air filter housing end.
2. Remove the air filter housing end.
3. Remove the wing nut.
4. Remove air filter element and clean or replace the element.
5. Reinstall the air filter element and wing nut.
6. Install the air filter housing end retaining ring.
7. Tighten the retaining ring wing nut.
8. Push the reset button on the indicator upon replacing or cleaning the air filter.



⚠ CAUTION

- In dusty or other harsh environments, increase the frequency of cleaning or replacing of filters.

13.6 Cleaning/Replacing the Fuel Filters

Frequency:

Pre-Fuel Filter/Clean	Daily
Fuel Tank/Drain Water	Every 200 Hours
Main Fuel Filter/Replace	Every 500 Hours

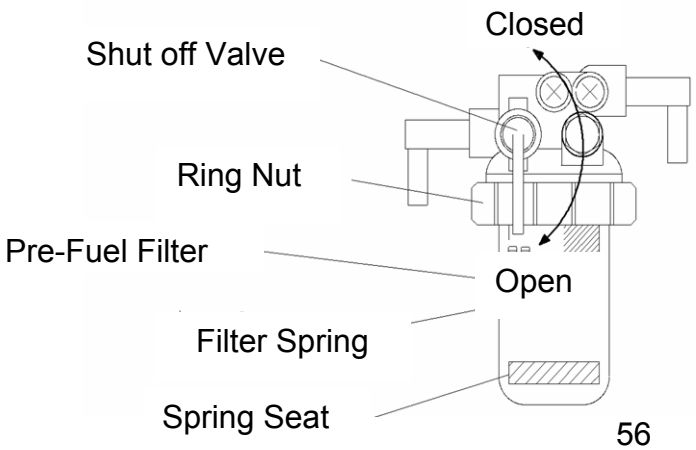
Procedure for the Pre-Fuel Filter:

1. Turn the fuel shut off valve on the top of the pre-fuel filter to the CLOSED position as shown in the below diagram.
2. Unscrew the ring nut by turning counterclockwise and remove the retaining cup and pre-fuel filter element.
3. Remove any debris and/or water from inside the bowl, and then clean the pre-filter element using compressed air (or replace if necessary). **Note:** If replacing the pre-filter element, replace the o-ring as well.
4. Reassemble and turn the butterfly valve to the OPEN position as shown in the diagram below.
5. Without starting the engine, place the ignition switch in Run/Preheat position for at least 30 seconds to bleed any air from the fuel system.

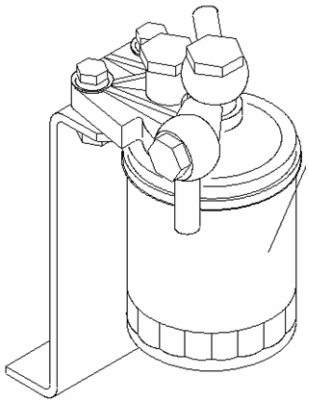
Procedure for Replacing the Main Fuel Filter:

1. Using a filter wrench, unscrew the main fuel filter by rotating it counterclockwise.
2. Clean the sealing surface on the upper cover.
3. Apply a light film of new oil on the fuel filter seal and thread the new fuel filter on until the seal makes contact with the sealing surface. Using a filter wrench, turn the additional 2/3 of a turn to seat the filter.
4. Without starting the engine, place the ignition switch in Run/Preheat position for at least 30 seconds to bleed any air from the fuel system.
5. Start engine and check for leaks.

Pre Fuel Filter



Main Fuel Filter



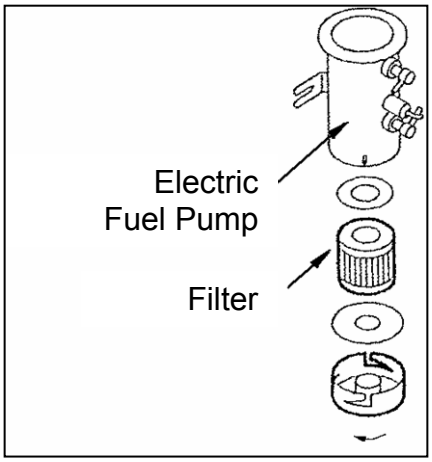
13.7 Replacing the Electric Fuel Pump Filter

Frequency:

Replace	Every 1000 Hours

Procedure:

1. Turn the bottom cover of the pump counterclockwise to remove the end.
2. Remove the electric fuel pump filter and seals
3. Install the new filter and seals in the reverse order.
4. Without starting the engine, place the ignition switch in Run/Preheat position for at least 30 seconds to bleed any air from the fuel system.
5. Start engine and check for leaks.



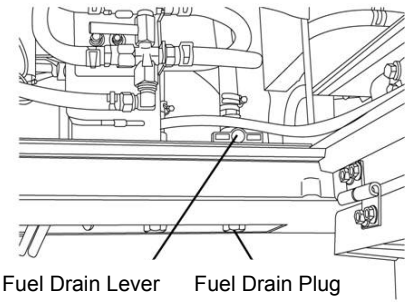
13.8 Draining Water from the Internal Fuel Tank

Frequency:

Drain	Every 200 Hours

Procedure:

1. Remove the fuel drain plug.
2. Turn the ball valve located just inside the enclosure counterclockwise to open the valve and allow any water in the bottom of the tank to drain.
3. After completely draining any water, turn the ball valve clockwise to shut the valve and then reinstall the plug.
4. Start engine and check for leaks.



13.9 Replacing LLC (Long Life Coolant)

Frequency:

Replace LLC	Every 1000 Hours

Procedure:

1. Remove the radiator plate located on the top of the enclosure.
2. Remove the radiator cap cover.
3. Remove the radiator cap and check seal (replace the seal if it is damaged).
4. Loosen the radiator drain valve and drain plug on engine side and drain the coolant completely.
5. Tighten the radiator drain valve.
6. Drain the coolant reservoir.
7. Install a mixture of 50:50 LLC and water into the reservoir to the full mark.
8. To avoid trapping any air, slowly fill the radiator with a mixture of 50:50 LLC and water.
9. Reinstall the radiator cap tightly.
10. Close the radiator cap cover and install the radiator top plate.
11. Check for leaks.
12. Start the engine, let it warm up, and check for leaks.
13. Turn off the engine and let it cool down.
14. Check the coolant reservoir and replenish if needed.

Note: Use GM SPEC 6277M or equivalent long life coolant only. Do not mix different brands of coolant.

14. Troubleshooting Table

Problem	Cause	Corrective Measure
Starter motor will not turn over.	1. Weak Battery 2. Dead Battery	1. Recharge the battery. 2. Recharge or replace the battery.
Starter Motor turns over but the engine will not start.	1. No Fuel 2. Water or contaminants in the fuel.	1. Add fuel to the fuel tank. 2. Drain any water from the pre-fuel filter and/or internal fuel tank. 3. Clean the fuel tank and fuel filter.
Engine starts but immediately stalls.	1. Low oil pressure. 2. High coolant temperature. 3. Air in the fuel system.	1. Check the oil and add oil if necessary. 2. Check coolant and add if necessary. 3. Bleed the air out of the fuel system.
Circuit breaker cannot be placed in the on position.	1. Circuit breaker has not been turned to the off position prior to turning it to on. 2. Overload 3. Terminal board cover is not completely closed.	1. Turn the breaker to the off position and then place it in the on position. 2. Decrease the load. 3. Close and secure the terminal board cover.
Excessive black or white smoke is coming out of the exhaust.	1. Excessive Load	1. Reduce the load on the generator.

15. Long Term Storage

(If the generator will not be used for more than 2 months perform the following procedure.)

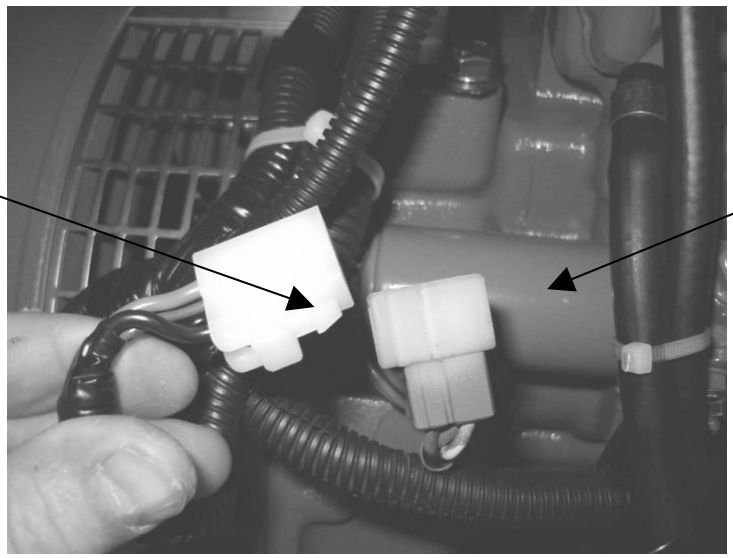
Procedure for Long Term Storage:

1. Remove the battery.
2. Change the engine oil.
3. Drain the fuel from the fuel tank and filters.
4. Clean all parts, cover the generator, and store in an area free of dust or humidity.

After Long Term Storage Starting Procedure:

1. Install the battery, check the electrolyte level and charge the battery if necessary.
2. Check all fluid levels as described in "Initial Start Up and Pre-Checks" beginning on page 32 of this manual and add fluid or fluids as necessary.
3. Disconnect the Shut down Solenoid connector to keep the engine from starting.
4. Crank the engine for 10 seconds. Wait 30 seconds and then crank the engine for an additional 10 seconds. **Note:** This helps prime the engine oil system.
5. Reconnect the Shut down Solenoid connector.
6. Start the engine. **Note:** If the engine does not start within 10 seconds wait 30 seconds before attempting to start the engine again.
7. Allow the engine to run with no load for at least 10 minutes.

Note: The "After Long Term Storage Starting Procedure" should also be performed before the initial starting of a new generator.



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